The Why of Aluminum in Cars

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MOTOR AGE

Volume XXXV
Number 16

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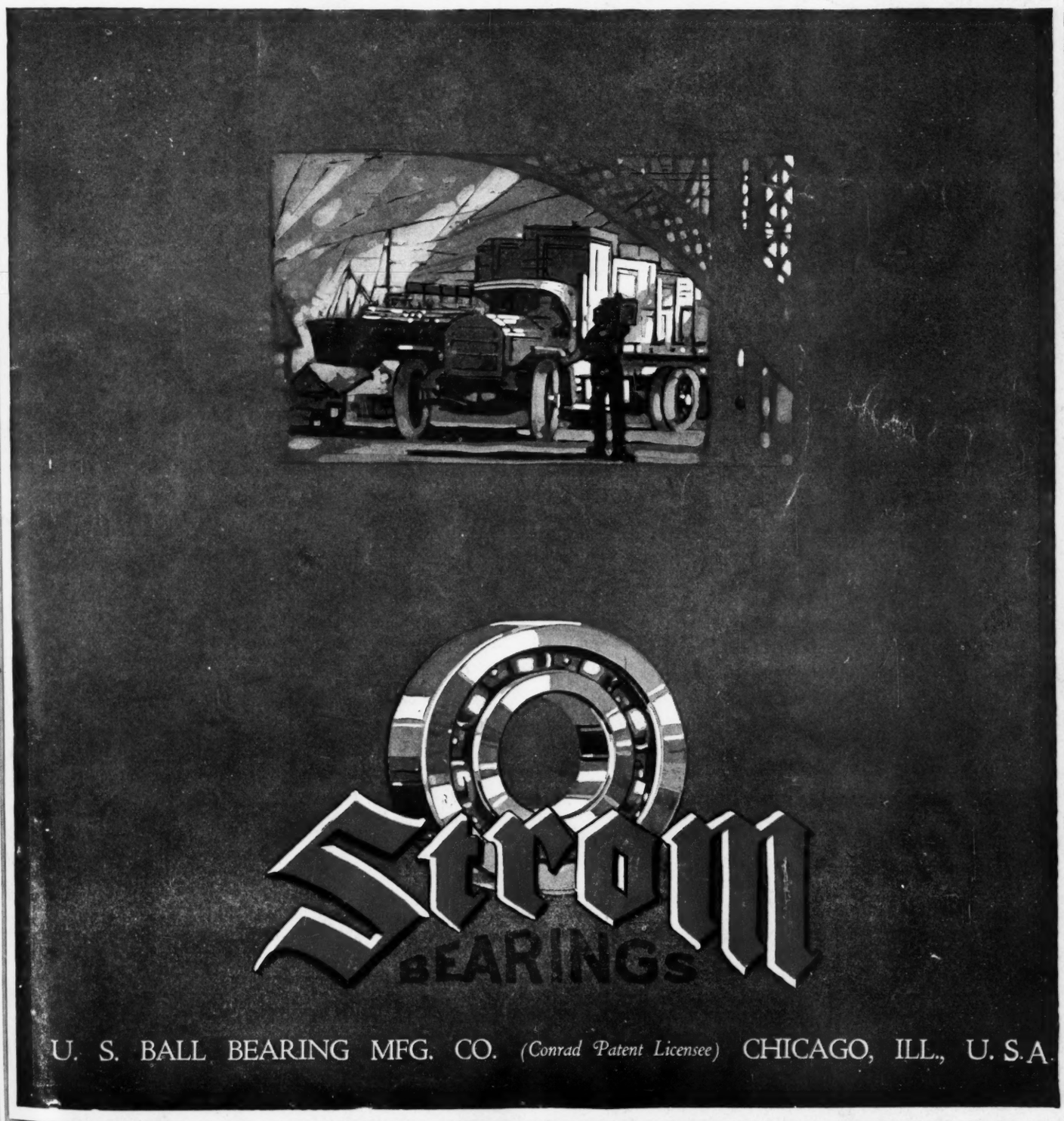

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MOTOR AGE

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MOTOR AGE

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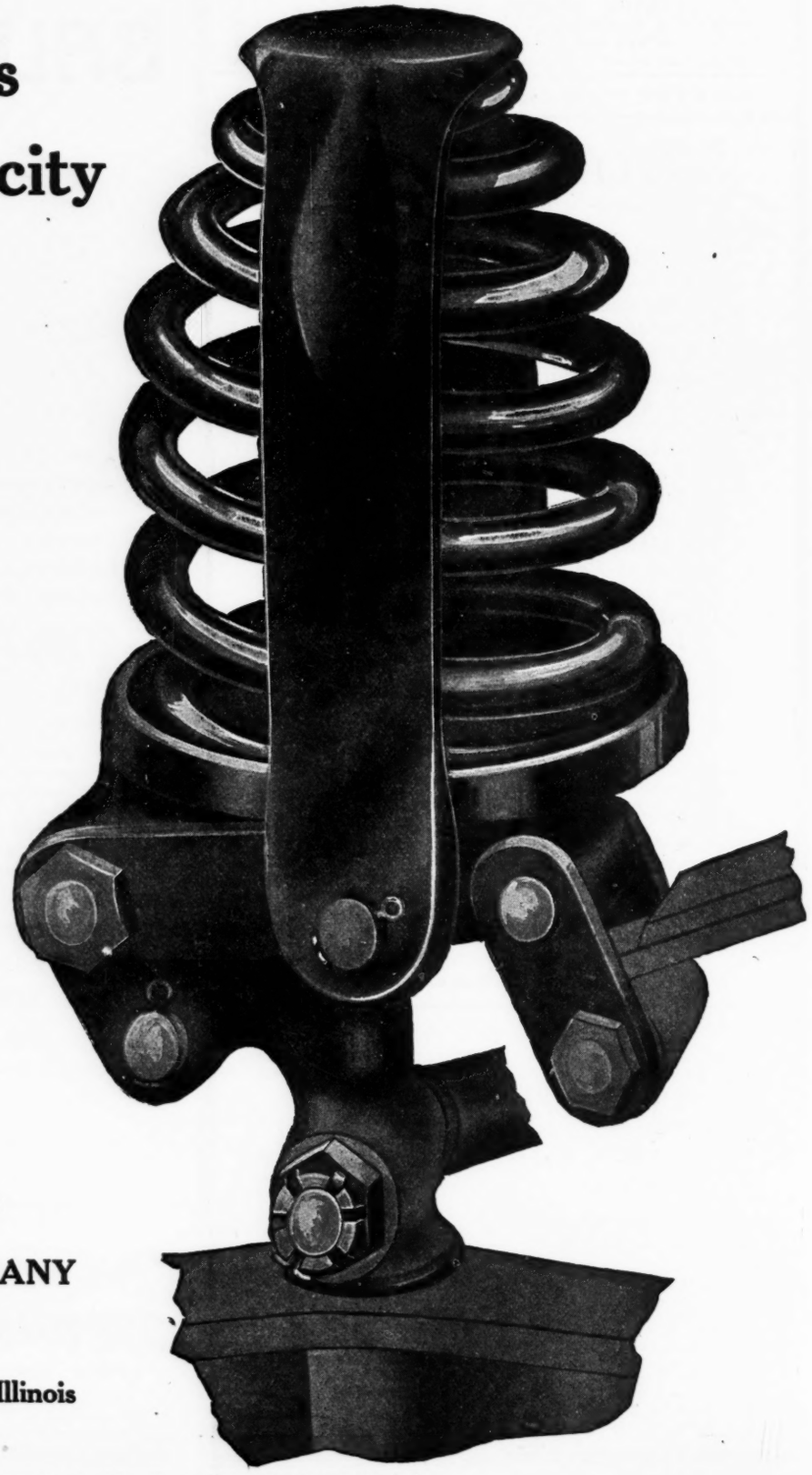
Greater Capacity



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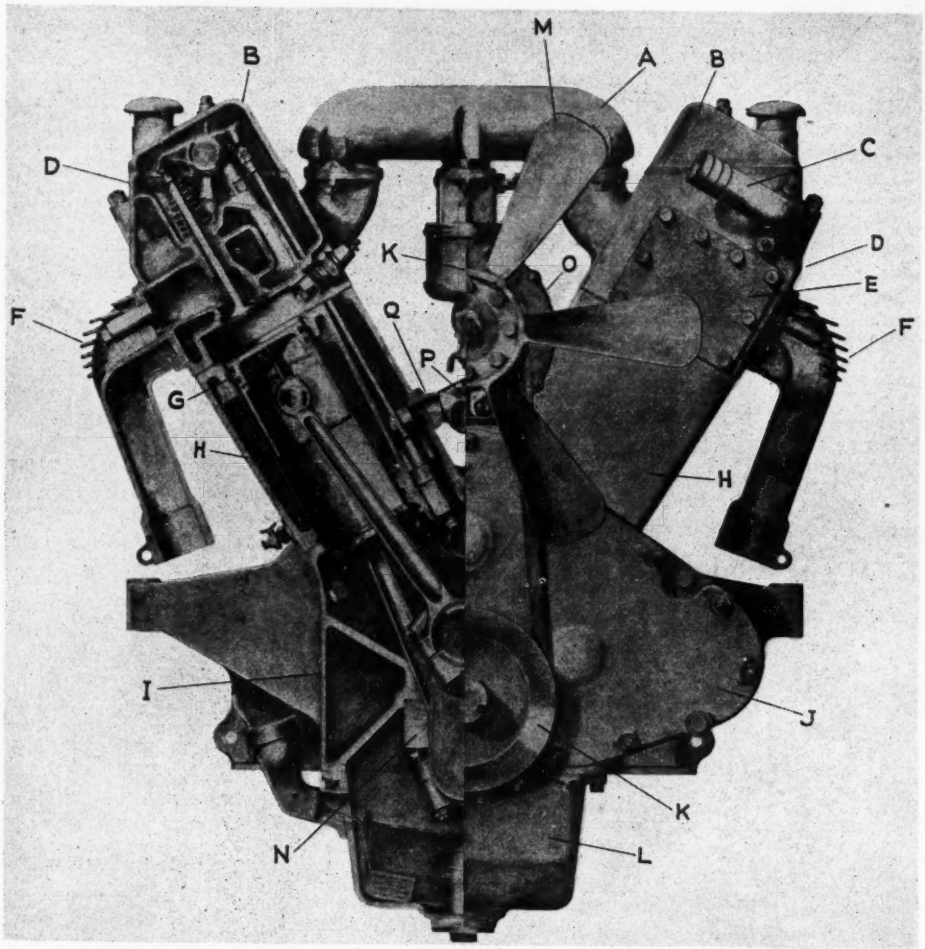
MOTOR AGE

THE WHY of Aluminum in Motor Cars

By H. M. Taylor*



A—Intake manifold.
B—Cylinder head cover.
C—Cylinder water outlet elbow.
D—Cylinder head.
E—Cylinder head end cover.
F—Exhaust manifold.
G—Piston.
H—Cylinder.
I—Crankcase.
J—Timing gear cover.
K—Fan pulley. (Driver & driven).
L—Oil pan.
M—Fan.
N—Crankshaft bearing caps.
O—Water pump.
P—Fan and water pump bracket.
Q—Cylinder water inlet elbow and tee

An eight-cylinder built almost entirely of aluminum

When the French emperor, Napoleon III, presented his baby son, the Dauphin, with a rattle made of aluminum, he made him a present which at that day, 1856, was worth about $1,000. Except for its historical value that toy today could be bought for 25 cents. The royal rattle was one of the first objects to be made from aluminum, which then was sold at $100 a pound, and that in spite of the fact that it forms 8 per cent of the earth's crust, according to metallurgists.

Aluminum is not the lightest metal we have, but it is the lightest one used commercially. The real feather metal of them all is magnesium, and this sometimes is used as an alloy with aluminum to make a material still lighter than aluminum.

LARGE motor car manufacturers used aluminum more or less freely in motor car construction prior to the war, but it was not until the success of powerful war engines of the Hispano-Suiza and Liberty aviation engine types that the field for the use of aluminum in the automotive industry became generally known and appreciated.

However, a great deal about the nature and characteristics of aluminum remains to be said, and in view of recent statements by leading automotive designers predicting the wide use of the metal in motor car construction during the coming year motor car dealers and distributers will find it to their advantage to know more about it. They should know what its very desirable qualities are, where it comes from, how it acts and why it is more and more taking the place of the commoner metals in the new models.

For purpose of definition let us understand here by the use of the word "aluminum" not pure aluminum, unless so stated, but aluminum alloyed or combined with small quantities of other metals, that is, commercial aluminum. For it is aluminum in this alloyed form which best lends itself to casting and which, because of its many desirable qualities or properties, is used so extensively in the automotive industry.

Characteristic Features of Aluminum

The general characteristics which make aluminum valuable as a motor car material are numerous. First is its extraordinary lightness, combined with its high tensile strength and rigidity. Aluminum is about two and a half times as light as iron. The advantage of this is obvious. To increase

*Lynite Laboratories of Aluminum Castings Co.

speed you either must reduce weight or increase propelling power. Hence, every pound your car is made lighter, so much more weight can be carried as load, or so much greater is the acceleration or pickup. In view of this, then, consider the advantage of large aluminum parts, such as crankcases, oil pans, radiator bodies, etc. The aluminum in the Liberty engine decreased the weight more than 325 lb. An aluminum body alone is said to make a car 100 lb. lighter.

The lightness of aluminum appeals also to the manufacturer of motor cars in that it means reduced freight and cartage charges, easier handling in the shop and easier machining, with its attendant saving in time and cutting tools.

In strength and rigidity aluminum likewise exhibits remarkable qualities. It not only surpasses cast iron but equals many kinds of steel. Whereas cast aluminum with tensile strength as low as 18,000 lb. a square inch has been used for many years in motor car work, and indeed still is to a surprising extent, casting alloys with a wide variety of uses have been developed showing a tensile strength varying from 24,000 lb. a square inch to as high as 36,000 lb. a square inch. This simply means that an aluminum bar 1 in. square would stand from 24,000 to 36,000 lb. without breaking or twice as much as cast iron. And the tensile strength limits have by no means been reached.

Rigidity of Steel

Moreover, sheet aluminum can be raised as high as 70,000 to 80,000 lb. a square inch. The relative rigidity of sheet aluminum and steel is shown clearly in Fig. 1 and 2. Here we have a sheet of rolled aluminum and one of rolled steel of exactly the same weight, length and width—Fig. 1. One end of each sheet is fastened in a holding block, while from the other ends equal weights are suspended, Fig. 2. The steel is bent almost 45 deg., while the aluminum is hardly disturbed at all.

Another decided advantage of aluminum is its beauty of appearance. Rivaling silver and gold in luster, its natural appeal to buyers of motor cars is unquestioned. It is almost an axiom in trade that any product which will do the work and is not prohibitive in cost will far excel its competitors if it has a quality appearance.

Still another advantage of aluminum, and by no means the less important because a technical merit, is its power to absorb and conduct heat. The advantage of its heat conductivity is well illustrated in the aluminum piston, used with such success in the Liberty engine. The function of the piston among others things is to provide a good path for waste heat to flow from the combustion chamber to the water-jacket. To perform this function the piston must be made of a material that is a good conductor of heat. As about 80 per cent of the heat generated in the combustion chamber is waste heat, the necessity of a good heat conductor is clear. The better the conductor, the cooler the piston, and accordingly the less depositing of carbon on the crown of the piston. The advantage of the aluminum piston becomes obvious when it is recalled that aluminum conducts heat about three times as readily as iron.

In connection with the aluminum piston we might mention again the property of lightness which the metal possesses. The vibration and jar caused by the weight of the iron piston traveling up and down in the cylinder is almost divided by three, as iron exceeds aluminum in weight about two and a half times.

Let us now scan the so-called disadvantages of aluminum as motor car material. Granted its exceptional qualities for use in certain large engine parts, and in ornament and body construction, how about its use in the more intricate parts? The answer to this is simply that the use of aluminum depends almost entirely upon its known characteristics or properties. The entire aluminum industry is scarcely thirty years old, and only within the last ten years has our knowledge become adequate for extensive manufacture. In fact, our knowledge of aluminum may be said to cover about the same number of years as our knowledge of iron does centuries.

As an example of how the objections to aluminum are overcome by knowledge of its characteristics, take the case of the aluminum piston just mentioned. Before this piston was fully developed, considerable objection was raised, and justly, because of scoring and piston slap within the cylinder. But when it was shown that aluminum when heated has considerable power to expand, the difficulty speedily was met by making the proper allowance for clearance. Accordingly it has been worked out that an allowance of 0.002 in. for every inch in the diameter of the piston gives the desired freedom of play when the engine is highly heated from running at full speed. This, of course, is not an exact clearance formula but is approximate for pistons not exceeding 4 in. in diameter. The piston slap is still present until the engine warms up.

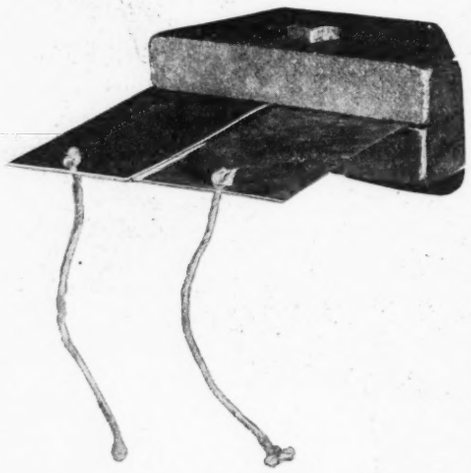


Fig. 1—Sheet of rolled aluminum and rolled steel of exactly the same weight, length and width

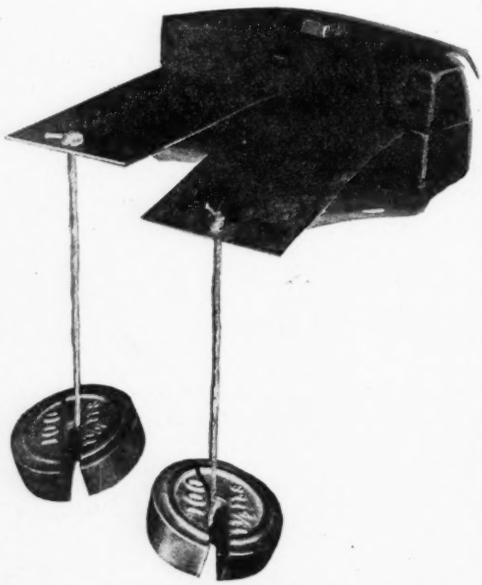


Fig. 2—When equal weights are suspended the steel is bent almost 45 deg. while the aluminum is hardly disturbed

Metal working requires exceptional skill and experience. There is no surer way to give aluminum a black eye than for the novice to try and use the metal for some specific purpose and from his own designs while he is ignorant of the metal's composition or peculiar behavior under varying conditions. One should guard against getting the idea that iron, steel and aluminum are generally interchangeable, and the advantage all in favor of aluminum. These metals, indeed all metals, vary as widely in properties and behavior as cars, trucks and even airplanes vary in design and performance.

Where Aluminum Is Found

Aluminum does not occur as a metal by itself. It is always found in combination with other substances. It is, however, the most common metal in existence, and only exceeded by oxygen and silicon in its abundance. Indeed, something like 8 per cent of the earth's crust is pure aluminum, while one can scarcely step on terra firma without treading upon the metal in one of its various forms. Pure aluminum generally is extracted from a clay-like substance, known as bauxite, as this form of the metal lends itself most readily to commercial treatment: Bauxite is mined in the United States in large quantities, principally in Arkansas, Alabama, Georgia and Tennessee. In color it occurs all the way from white through yellow and brown to red. By chemically roasting the bauxite containing aluminum is reduced to aluminum oxide, which, in turn, by an electrolytical process devised by Hall in 1886 is reduced to pure aluminum. The pure aluminum, although weight for weight possessing about the same tensile strength as iron, is not used in the automotive industry. It is when the pure aluminum is combined with small quantities of other metals, notably copper and zinc, that its intrinsic value for motor car manufacture becomes apparent.

The alloys of aluminum are numerous. The most common and generally useful of the aluminum alloys are those containing from 1 to 15 per cent of copper, with the balance of aluminum. The general standard alloy in this country, used in casting motor car parts, has been up to date one in which the copper content is about 8 per cent. Its English equivalent is said to be an alloy in which copper is from 2 to 3 per cent, zinc 8 to 10 per cent and the rest aluminum. The aluminum-copper alloys as cast have a tensile strength of from 14,000 to 20,000 lb. a square inch, and an elongation, that is,

ALUMINUM PARTS IN PASSENGER CARS

Accelerater pedal
Accelerater pedal plate
Body
Breather body
Breather cap
Bearing caps
Cylinder block
Cylinder head
Cylinder head cover
Cowlboard
Carbureter body
Crankcase
Clutch cone
Dust cap
Door bumper socket
Door handles
Differential carrier
Differential carrier cover
Engine support brackets
Footrest bracket
Fan
Fenders
Floor and toeboards
Flywheel housing
Fan support bracket
Filler cap (gas)
Generator bracket
Hot air stove
Hub caps
Hood
Intake manifold
Oil pump body
Oil pump body cover
Oil pressure regulator body
Oil strainer body
Oil filler body
Oil filler cap
Oil pan
Oil gage body
Pistons
Pedal floor plates
Rocker shaft support
Steering wheel spider
Steering column cowl bracket
Spark and throttle lever
Spark and throttle sector
Steering gear housing
Transmission case
Transmission case cover
Thermostat body
Throttle lever
Timing gearcase cover
Valve lifter rod cover
Water pump body
Water pump cover
Water pump support
Water inlet pipe
Water outlet pipe

ALUMINUM PARTS IN COMMERCIAL CARS

Breather body
Breather cap
Crankcase
Cylinder
Cylinder block
Cylinder head
Cylinder head cover
Clutch cone
Fan
Fan pulley
Flywheel housing
Fan support bracket
Filler cap (gas)
Governor casing
Governor casing cover
Hot air stove
Intake manifold
Oil pan
Oil reservoir
Oil reservoir cover
Oil strainer body
Oil pump body
Oil pressure regulator body
Pistons
Radiator guard
Radiator header upper
Radiator header lower
Radiator shell
Spark lever
Sector (spark and throttle)
Steering wheel spider
Steering gear housing
Timing gearcase cover
Transmission case
Throttle lever
Transmission case cover
Worm gear carrier
Worm gear carrier cap
Water pump support
Water pump support caps
Water pump body
Water pump cover
Water pump outlet elbow
Water inlet pipe
Water outlet pipe

Repairing Broken Parts of Aluminum

Broken aluminum parts can be repaired successfully by welding. No little skill is required in doing the job, however, as the welder has to contend with rapid conduction of heat, contraction, and other peculiarities of the metal. With the development of a welding process by the oxy-hydrogen and oxy-acetylene flame, sheet aluminum readily can be welded and the seam dressed off so that the union scarcely can be located.

When working with aluminum, the processes used with other metals must be forgotten. Two castings may look exactly alike to the eye, and yet one may be twice as strong as the other. Aluminum will weld satisfactorily with the oxy-acetylene and the oxy-air processes, but to solder it requires considerable knowledge of its peculiarities. Many companies that handle large quantities of aluminum daily state it cannot be soldered. Others see no difficulty in doing the work.

The requisites for a successful soldering operation are that the aluminum must be free from grease or other foreign matter and the solder must be correctly prepared or else some of its ingredients are sure to be burned. Most cases of failure in aluminum soldering, however, can be laid at the door of the operator. The part to be soldered is heated up to such a degree that a thin oxide is formed on the surface, and instead of soldering two pieces of aluminum together the operator does nothing but solder the two thin pieces of aluminum oxide together, and at the slightest strain they part. A flux composed of cadmium, 10 parts; zinc, 10 parts; tin, 10 parts; lead, 1 part, gives reasonably good results. Common table salt is used extensively also as a flux for aluminum.

The machining of aluminum is difficult. It is a great tool heater, and in that way very much resembles copper. The work has to be carried on under a constant stream of cooling or lubricating agent, the most popular of which are a mixture of lard oil and water or kerosene.

In working aluminum small and light cuts must be taken, using turpentine, benzine or petrol as a lubricant, while the cutting speed must be high. For filing aluminum, a single-cut file will be found to last longer than a cross-cut. The file will become somewhat quickly clogged, but cleaning can be carried out by dipping it in a strong solution of caustic soda and washing in running water, followed by rapid drying.

stretch, of from 1 to 20 per cent. It is further possible to increase the tensile strength very considerably by mechanical treatment without decreasing the very desirable property of elongation.

The zinc-copper-aluminum alloys are another very important group. Greater rigidity is acquired by increasing the zinc proportions as high as 20 and 25 per cent, and the resulting alloy has all the other desirable qualities of the straight copper-aluminum alloys, except that the weight is slightly increased. The zinc-copper-aluminum alloys are believed to have wonderful possibilities, but they have not been fully investigated and tested to date.

Aluminum also alloys readily with nickel, manganese, magnesium, iron and even tin.

Aluminum Motor Car Parts

More than 100 parts of the gas engine alone have been made of aluminum. The cut on page 7 shows an eight-cylinder engine built almost entirely of aluminum. Thirty per cent of the parts of the Liberty engine were made of aluminum. Among these parts were:

Upper and lower crankcase housings.
Twelve pistons.
Piston washers.
Water pump housing.
Camshaft housing.
Intake pipe.
Carbureter.
Oil pump housing.
Crankcase breather.
Crankcase oil fillers.
Miscellaneous small parts.

Consider a moment the part played by aluminum in this engine. The total weight of the engine, exclusive of radiator and water, was about 825 lb. Of this total weight the finished aluminum parts weighed 225 lb. If, now, iron in some form had been used instead of the aluminum, this portion of the total weight would have been at least two and a half times as heavy, or two and a half times 225. This would have made a weight of fully 562 lb. and would have increased the total weight of the engine from 825 to 1162 lb., or a net increase in weight of nearly 340 lb.

Among the many aluminum parts used in the motor car, attention is called to the accompanying table.

This year will see the improved and perfected use of aluminum in all the many parts in which it is used at present, as well as its wider application. Aluminum-backed, babbitt-lined bearings soon will be in general use. The day of the aluminum wheel is not far distant.

What of the Future

The future of aluminum is very bright. There is neither scarcity in the source of supply nor in its production. In 1918 180,000,000 lb. were produced in the United States alone. As 95 per cent of the world's production last year was diverted to war purposes, its economical use with the return of peace in the automotive industry is apparent.

Aluminum only became commercial in the last decade of the nineteenth century, while iron goes back to the B. C. days. In fact, the aluminum industry may be said to be in the same stage to-day as was the steel business in the days of the first Carnegie mills. To predict, therefore, the future of aluminum in the motor car industry, or indeed any industry, is utterly impossible. Its future defies estimate. One dare not predict for fear to-day he be considered an enthusiast and to-morrow branded as short-sighted.

N. A. D. A. Works to Help Dealers

Nine Departments Give Service to Trade—How Each Functions

ST. LOUIS, Mo., April 12—The N. A. D. A. now has nine departments, all in good working order, to aid the dealer. The services of any or all are open to each member, and at least one service will be given to any dealer who finds himself in a jam and nowhere else to go for advice. If the service extended is worth anything to him, the dealer aided will be expected to join. The departments are:

Employment Bureau.
Legal Department.
War Tax Rulings Department.
Legislative Aid Department.
Speakers' Bureau.
Advisory Advertising Department.
Trade Information Department.
Highways Construction Department.
N. A. D. A. Bulletin.

The employment bureau is designed to place salesmen, department heads and other high class employes where they will fit. The legal department will give information as to the laws of any or all states and will advise how to keep out of lawsuits. The War Tax Rulings department supplies any information sought on this subject, especially the practical application. The Legislative Aid Department helps push good legislation and oppose bad legislation. It can bring wide pressure to bear on a city council or a state assembly.

The Speakers' Bureau supplies speakers for any automotive occasion, any place. The Advisory Advertising Department will criticise and suggest local advertising copy. The Trade Information Department is a survival of the telegraph bulletin service during war times by which dealers were warned of new conservation tricks. It is working on the truck situation. The Highways Construction Department can explain how to build roads and it always has the latest Federal and state requirements on hand. The N. A. D. A. Bulletin goes to all members and helps those who read it.

Last week the N. A. D. A. offices received a call from a manufacturer who wanted to have a dealers' convention and did not know exactly how to go about it. In 30 min. he had a plan all drafted, speakers on topics to suit him assured and a world of detail worked out for him. He looked over the things the N. A. D. A. are doing and decided that his dealers should hear all about it, so he invited the N. A. D. A. to take a place on the program for itself.

BOSTON SET FOR DRIVE

Boston, Mass., April 11—J. W. Maguire, of the Pierce-Arrow, has been chosen by President J. H. MacAlman of the Boston Automobile Dealers' Association to head the committee which will put over the big Victory Loan in Boston for the motor industry. Chester I. Campbell, who is coöperating with the government in the loan, received a long-distance call from Washington this morning stating that a steamer had just arrived at Baltimore unexpectedly with more than 150 big cannon captured in the war which will be used in the drive throughout the country. He was requested to take a train to get to Baltimore to superintend the unloading and disposition of the guns, and he said that to do that an airplane would be needed. The Government told him he could have that means of getting there if a machine could be secured, but he declined and took the train for Baltimore in the afternoon.

NEW YORK APPOINTS CHAIRMAN

New York, April 12—C. M. Brown, president of the New York Automobile Dealers' Association, is to head the automotive and accessories trade committee of the Rainbow Division in the Victory Liberty Loan drive. Charles E. Miller, who served as vice-chairman in the Fourth Loan campaign, will serve in a similar capacity in the Fifth, as will Secretary Charles A. Stuart and George W. Holden, who will act as bond advisor. In the last campaign the committee exceeded its quota by $44,000, the total amount sold being $20,447,000.

FRENCH TRACTOR TRIALS

Paris, March 22—By mail—America, France and England will be represented at the official French tractor trials to be held at Saint-Germain, near Paris, March 30-April 6. The Ministry of Industrial Reconstruction and the French Agricultural Tractor Syndicate are jointly responsible for these trials, which, it is believed, will become the only official test of their kind to be held in France.

It is evident from the list of entries that European motor car firms are interesting themselves in the tractor, for among the new machines to be demonstrated are Renault, Delahaye, De-Dion Bouton, Tourand-Latil, Schneider and the Paris General Omnibus Co. The English participant is the Austin tractor, shown for the first time in France at the Lyons fair. Among the American machines are Cleveland, Rip, American, Titan, Pidwell, Case, Avery, Butterosi, Moline and Fordson. In all sixty machines will take part in these trials.

LIBERTY ENGINE CONTRACTS

Washington, April 11—All contracts for Liberty twelve engines were completed when Packard made final deliveries on its contracts March 21. A total of 20,478 engines was delivered to the Government by all the different companies from which they had been ordered, as follows:

Firm	Number produced	Percent of total
Packard	6,500	32
Lincoln	6,500	32
Ford	3,950	19
General Motors	2,528	12
Nordyke-Marmon	1,000	5
Total	20,478	100

DENVER PLANS SHOW BUILDING

Denver, Col., April 11—As a result of the Denver automotive show last week, the Denver Automobile Trades Association is planning to build before next spring a $150,000 building for shows and association headquarters. Present plans call for a structure containing 80,000 to 100,000 sq. ft. of floor space for exhibit purposes, and the cost may go considerably beyond the $150,000 set as a minimum figure. A dozen members of the trades body tentatively have subscribed about $65,000 toward the enterprise.

A committee to work out details for the project will be appointed soon, and stock in the building corporation to be formed will be sold exclusively to association members, making the enterprise entirely a trades body affair. The general plan is to have a gymnasium, clubrooms and other special features to make the association headquarters attractive and serviceable, and to rent the auditorium part of the building for various events outside of the yearly show dates.

IOWA PROSPECTS EXCELLENT

Des Moines, Iowa, April 12—Iowa dealers are optimistic over the spring trade prospects in the Hawkeye state. C. L. Herring, who is probably in as close touch with the business situation as any dealer in the Middle West, thinks the motor car business in Iowa this spring will be far ahead of the early estimates. According to Mr. Herring the outlook was never brighter. Trade in the cities and towns already has reached the point estimated, although the business with the farmers is lagging some. Conditions of uncertainty which prevail among the farmers are thought to be responsible for this lagging. However, during the last ten days weather conditions have been such as to remove some of these conditions.

An unusual amount of rainfall has put the soil in almost ideal condition for spring farm work. According to the crop experts, the Iowa winter wheat crop is 101 per cent as compared to normal, which is a gain of 21 per cent over 1918. Unless there is considerable abandoned acreage, this would make possible a production of approximately 18,525,000 bu.

ALLEN TO MOVE PLANTS

Columbus, Ohio, April 14—The Allen Motor Co. will move to Columbus. Allen has five plants at Fostoria and Bucyrus and has been in operation six years. Its record output is 5000 cars, made in 1916. The company hopes to boost its production to 20,000 cars in its new Columbus plants. The factories formerly occupied by the Columbus Buggy Co. will be occupied by Allen. The Scioto Rubber Co. is to be absorbed in the deal.

TO PLAN TRUCK SHOWS

New York, April 14—Martin L. Pulcher, vice-president of the Federal Motor Truck Co., has been appointed chairman of the N. A. C. C. motor truck show committee to arrange for proposed exhibitions of trucks in New York and Chicago next winter during the national motor car shows. A. J. Whipple, general sales manager of the Diamond T Motor Car Co., and David S. Ludlum, president of the Autocar Co., are on the committee.

The motor truck committee proper has been expanded by the addition of the fol-

lowing: David C. Fenner, Mack Bros. Motor Car Co., and R. H. Salmons, Selden Motor Vehicle Co. F. W. Fenn, who has handled the rural motor express department, has been made secretary of the committee. Committees to consider further standardization of trucks in co-operation with the Society of Automotive Engineers and to consider revision of the standard service and repair parts policies also have been appointed.

JOBBERS MAY HAVE SHOW

Chicago, April 11—There probably will be a jobbers' and dealers' show in Chicago the latter part of October or the first part of November. This was decided at a meeting of the board of directors of the Automotive Equipment Association here Monday. The decision as to whether the show is to be a closed show to manufacturers will be decided at the annual convention at Hot Springs, Va., June 2-7.

An advisory committee, consisting of three manufacturers and three jobbers, was elected. The committee is: R. R. Englehart, chairman, Iowa; H. H. Oliver, Illinois; Fred Campbell, Missouri; R. A. Stranahan, Ohio; J. S. Procter, Minnesota; L. P. Halladay, Illinois.

Discussion of the tax question as it affects the price of equipment, was postponed until the convention. The name of the Ways and Means Committee was changed to the Board of Governors.

FORDSON AT $926

Des Moines, Iowa, April 14—April 21 the retail price of the Fordson tractor in the territory including Iowa, Nebraska and South Dakota advanced to $926 plus freight and unloading charge. This is an advance of approximately $40. To the dealer the price remains the same; hence, the advance is just so much more profit for the dealer. This is done in lieu of increasing discount.

G. M. ABSORBS MICHIGAN

Lansing, Mich., April 11—The Michigan Crankshaft Co. is the latest organization to be added to the General Motors holdings. By this deal the National Engineering Co., Saginaw, which was owned by the Michigan Crankshaft Co., automatically becomes General Motors property.

The Michigan Crankshaft Co. was organized ten years ago with a capitalization of $50,000, later increased to $200,000. With the additional capital it bought the National Engineering Co. at Saginaw. J. W. Wilford will remain at the head of the company and will continue the management of the Lansing and Saginaw plants.

PROFIT-SHARING FOR G. M.

Detroit, April 14—Not only is General Motors to spend $37,800,000 the coming year for plant construction and extensions but it has a saving and investment plan under which the workers will have a chance to share in the business. Thrift will be encouraged in the plan, whereby General Motors will deposit in an investment fund an amount equal to the savings of the employee, dollar for dollar, up to $300 a year. This plan has been approved by officers and directors and will be voted on by the stockholders April 30.

Car Output Gains Faster Than Truck

Meanwhile Industry Still Waits for Lower Steel Prices to Buy

DETROIT, April 14—The larger automotive plants continue to buy just what steel they need when they need it, and the prospects are that until the railroad administration and steel committee agree on the price the railroads must pay for the steel they will continue to do so. The administration is looking for a lower price, and parts makers especially believe a cut in price for the railroads will means an additional cut for automotive makers.

The trade is demanding lower prices, the makers of cars and trucks are demanding lower prices, and the parts makers are demanding lower material prices. This is the situation right at present. Some are holding back for an expected drop, others declare this reduction impossible.

While the car business has been flourishing ever since the big plants got back to peace production the truck industry has been rather backward, it is said. Makers of axles and other parts declare they are prepared to do twice the truck business they now are doing. Truck makers, however, refer to good buying and fair production, while the parts makers hold that the truck business is not what it could be. Competition in the truck field is particularly keen, and this is shaping itself into a matter of efficiency and price. The best truck at the best price, it is believed, is going to get the business, and the truck makers are trying to bring prices as low as possible. This policy has curtailed production inasmuch as the makers hoped steel price cuts would aid in decreasing manufacturing costs and permit lower retail prices. The price fixing has given this line of the industry greater confidence than any other seemingly, for the last two weeks have seen a decided increase in truck production.

Production Shows Gain

Meanwhile car production shows remarkable gains. Shipments in March increased nearly 5000 over the same month last year, with 16,728 as compared with 21,500 in March, 1919.

Ability to get motor car freight cars has been materially bettered in the last month. The N. A. C. C. has had a representative of the railroads personally located in Detroit with authority to check up and route freight cars. At present there is a surplus of 6000 freight cars in and around Detroit. Shortage of materials is holding up production, however, of complete cars. The labor situation is not bad, manufacturers reporting that returned soldiers are coming back to the factories.

Maxwell has completed its last military tractor and is getting back into full peace production of cars. The machine finished last was No. 2000 and a 5-tonner. The original contract called for 3000, but the armistice cut this a third. The company already has run its car production up to 220 daily.

Scripps-Booth is turning out forty cars a day now and has in prospect bigger production as a result of the $1,500,000, which is its part of the General Motors expansion. It will get a new factory.

Liberty broke all previous production records last month. More cars were built and shipped in March than during any previous month in the history of the company, and the business done during that period amounted to more than $1,000,000. Last November this concern was on practically a 100 per cent war basis, about the whole works being occupied with the making of trailers for the aircraft service and trucks for use abroad.

Word comes from Sandusky, Ohio, that Maibohm will move its entire organization to that city from Racine, Wis. It is building a $175,000 plant at Sandusky with 75,000 sq. feet. of floor space, which will be ready in about sixty days. Meanwhile the company will occupy temporary quarters at Sandusky. The new plant is planned for a production capacity of fifty cars a day.

BRISCOE MAKES 75 A DAY

Jackson, Mich., April 14—Briscoe has pushed its production within the last week to seventy-five cars a day. Less than two weeks ago the company started turning out fifty a day. It is expected that before the end of the month the 100-a-day mark will be reached.

KNOX AND MILITOR MERGE

New York, April 12—The Knox Motor Co., Springfield, Mass., and the Militor Corp. have been merged and will do business as the Militor Motors Co. with a capital of $2,500,000. The company plans to increase the production of Militor motorcycles and will add a light car. It is planned to continue production of Knox engines.

N. R. Sinclair will be president of the new company. Associated with him are George W. Dunham, vice-president of the Militor Corp. and formerly president of the S. A. E.; second vice-president, R. L. Notman, secretary of the Militor Corp. treasurer, E. O. Sutton, formerly treasurer of the Knox Motors Co. Production activities will be centered in the Springfield plant.

RUBBER IMPORTS AGAIN DOUBLED

New York, April 12—Rubber imports for March reached a figure not attained by any single month in the last four years. The 28,223 tons of crude rubber brought in last month more than double the 14,079 tons for February and, compared with 17,161 tons for March, 1918, show an advance of 11,062 tons.

The Rubber Association of America has compiled the following list of importation figures for crude rubber for the last four years:

	1916 Tons	1917 Tons	1918 Tons	1919 Tons
January	9,161	12,788	16,084	7,235
February	1,597	10,162	13,108	14,079
March	10,070	18,624	17,161	28,223

EDITORIAL

War's Lesson in Trucks

NINETY-TWO THOUSAND men were taken overseas from America and trained to drive and care for trucks. They were given six weeks forced training in routine methods of truck maintenance. They were shown how to inspect and repair motor vehicles on a regular schedule. It is no more than logical to expect, through the influence of these thousands of men, there will be better truck service from service stations and better truck operation from driver.

WHAT is of broader significance is the fact that in our armies overseas there were two or three million men who most of the time were dependent on motor trucks for all their supplies and a part of the time were wholly dependent on trucks for their existence. These two or three million men are returning to American business and American farms with a new vision of the motor truck. They learned that truck transportation which sustained them at the front can prove just as practical in business at home.

Consideration for Tractor Dealer

PRECONCEIVED notions of how the tractor business should be conducted are giving way to practical considerations here and there. There is evidence that tractor manufacturers and distributers are giving close attention to the development of the tractor business and they are beginning to manifest a disposition to concede some things to the dealer and to make matters a little easier for him. This applies particularly to ideas of service.

SUCH concessions as the Emerson-Brantingham Implement Co. is giving in the way of extra discounts on repair parts and the privilege of returning unsold spares are significant. The plan whereby a scholarship in a tractor school is given with each tractor sold by the Nebraska and Iowa distributer of the Parrett tractor is another case in point.

OF great importance as affecting the cost and annoyance of giving service by the tractor dealer is the plan, recently inaugurated, whereby the International Harvester Co. is training tractor service men at its branch houses. Eventually this will place a competent tractor service man in every town from which tractors are sold, thus relieving the dealer of much of the service, a good deal of it trivial, which he now is called upon to give.

THE difficulty dealers and farmers have experienced in financing tractors because of the opposition or indifference of the local banker has slowed up tractor sales in many instances. Such a campaign as that being conducted by the Moline Plow Co. to educate and convert the banker to power farming ideas is to be commended.

ALL these things are significant and show an advance in thought and consideration for the dealer in the tractor business. It means that old ideas are giving way to newer and broader conceptions as to what is right and fitting and every such innovation augurs well for the future of the tractor trade.

Good Propaganda for Good Roads

THE good roads moving picture idea which figured rather prominently in the Illinois campaign for $60,000,000 in good roads bonds and which has been adopted by other states since now is to be taken up by the United States itself. This is as it should be. For the moving picture already has proved itself a powerful factor in the education as to the value of good roads. Illinois found it such. Michigan found it such. And there is every reason to believe every other state will find its highway development spurred to greater activity by the motion picture good roads film.

EDUCATION is the cure of many evils. When this country as a whole becomes educated thoroughly to the need of permanent, year-round roads there won't be a power on earth that can keep it from getting such roads. Just as education in the automotive industry is bringing better methods of care and maintenance of motors in the shops, in the hands of the owners, so education will bring to us better roads and, along with better roads, that increased efficiency which comes with extended motor transportation.

ROME was not built in a day, nor can America obtain in a day or a year the highways which those of us best acquainted with the needs of the country must desire. The mere vastness of the territory to be linked together by everlasting bonds of permanent highways makes the problem of proper education in good roads the larger. For this reason the entire automotive industry should lend its activities and hearty co-operation—as it is doing for the most part—to education as to the value, need and necessity for good roads. It is an education which is just as important for the industry as a whole, for the dealer and garageman, for the distributer and the manufacturer, as is education of the owner to the end that he will know it will pay him to own a car, truck or tractor. It is just as necessary an education as was the education of the owner during those war days of mechanic shortage to do the minor repair jobs on his own car, as it still is if the owner is to give his motor vehicle the proper treatment that will rebound to the credit of the dealer and manufacturer of that particular make.

THE automotive industry and its products have thoroughly educated the public as a whole to the value of the motor vehicle, as is attested by the present registration of motor vehicles in the country and by prospects for the future. These motors will be responsible for better highways. But it is a poor rule that doesn't work both ways. And it works both ways here. Better highways will be responsible for more motors. Better highways will increase sales of cars, trucks and tractors.

List of Entries for Indianapolis Grows

De Palma and Chevrolet Both In

CHICAGO, April 14—Ralph de Palma has entered the Indianapolis 500-mile race for May 31 and will drive his Packard with the engine of 299.2-cu. in. piston displacement. Louis Chevrolet, who has entered also, will drive a Frontenac presumably, though no name has been announced. This will make the sixth 500-mile race for de Palma at Indianapolis and the third time he has named an American car. He drove a Simplex to sixth place in 1911; in 1913 his Mercer met a jinx early in the race, his only starts with Yankee racers. In 1915 he scored a victory in the last 500-mile with the Grand Prix Mercedes. The entries for Indianapolis to date are:

Driver	Car
De Palma	Packard
Chevrolet	Unknown
Mulford	Frontenac
Resta	Sunbeam
Chassagne	Sunbeam
Brown	Hudson
Durant	Chevrolet
Milton	Duesenberg
O'Donnell	Duesenberg
Hitke	Roamer-Duesenberg
Goux	Peugeot
Cooper	Stutz
Thurman	Thurman

STEAM POWERPLANTS DISCUSSED

Chicago, April 12—The possibilities of steam and gas turbine power units for the propulsion of vehicles were discussed in a paper presented at the Mid-West Section of the Society of Automotive Engineers, April 11, by Charles W. Dake, chief engineer the Pyle-National Co. Mr. Dake, having spent many years in designing small turbines for train lighting, believes the turbine ideally suited for motor car use if properly designed. He spoke of a new turbine, now in the process of being patented, capable of developing a high efficiency and producing 1 hp. for each 3 lb.

William J. H. Strong of the Strong Engineering Co., Chicago, presented a paper on the steam powerplant developed by his company for Government aviation purposes. The powerplant is still in the development form, but it is claimed for it that it will weigh about 10 or 11 lb. a horsepower, complete, at an altitude of 15,000 ft., which is less than that of any gas engine. The unit is so compact in design that the 580-hp. size will occupy a space of 41 by 41 by 100 in., which includes the boiler and all auxiliary pumps and electrical equipment. Mr. Strong predicted that when the country has a national system of highways, large steam-driven vehicles will operate as our transcontinental trains now operate, equipped with sleeping cars similar to the present Pullmans.

TRUCK S. M. MEET

Philadelphia, Pa., April 12—Seventy-five per cent of the leading motor truck manufacturers of the United States and Canada, comprising a manufacturers' membership of fifty-six factories, was represented at the convention of the National Association of Motor Truck Sales Managers here. Lee J. Eastman, president of the Packard Motor Car Co. of Philadelphia, made the address of welcome. Three hundred diners heard John Barrett, director of the Pan-American Union, plead for control over South American trade through loans to the governments of Latin America.

Opportunities for trucks in this country were foreseen by J. S. Cravens, chairman of the highways transport committee of the Council of National Defense, in the decision of the United States railroad administration not to construct additional spur lines to railroads.

Col. Fred Glover, director of sales for the War Department, said that the recent army decisions prevented the unloading on the general market of large numbers of Government-owned trucks.

At Saturday's afternoon session plans for the most extensive construction work campaign to foster the country's motor truck business development were discussed. E. J. Foljambe, Philadelphia, emphasized the importance of the truck in increasing production. He predicted that this year's output of motor trucks would be increased 100 per cent and called attention to the fact that building construction is from one to two years behind.

E. T. Herbig, sales manager of the Service Motor Truck Co., Wabash, Ind., recently appointed chairman of a committee by the N. A. C. Co. to revise present surface and parts policies and the standard warranty, spoke on "Can We Improve the Present Standard Service and Parts Policies and Standard Warranty?"

The new members taken into the organization are as follows: Vim Motor Truck Co., Fulton Motor Truck Co., Noble Motor Truck Co., Parker Motor Truck Co., Commerce Motor Truck Co., Martin Truck & Body Corp., Garford Motor Truck Co., Menominee Motor Truck Co., J. C. Wilson Co., Velie Motors Corp., Canadian Ford Motor Truck Co., and the Corbett Motor Truck Co.

Springtime Is Reconstruction Time

That suit cost 75 dollars
I am saving 50 dollars by doing the job myself
When you find one of your good tires has been leaning against a steam pipe all winter, your spring song sounds like a hymn of hate
A one man top for the car
or a
one woman top for the wife
Isn't it wonderful when Tony Blazenitz (the only good repair man you know) returns from the job of overhauling Europe.
The motor corps girl has a reconstruction problem too.
Spring, the gentle vampire

—Detroit Motor News

Touring Bureaus for All Highways

Thirty or More Routes to Establish Co-operative Service This Year

KANSAS CITY, Mo., April 12—A system of co-operative touring bureaus is being established and organized by the Associated Highways of America on every route affiliated with the association. H. O. Cooley, secretary of the Yellowstone trail, is developing the bureau plan, with the basis of the seven bureaus now operating along the Yellowstone trail. It is expected that this year one or more bureaus will be opened on each of the thirty or more routes in the A. H. A., the information on each route to be cleared through a central office for the benefit of all. It is the plan that each highway association employ a man on full time to collect and handle touring information. When the program is in operation, any bureau will be able to give touring information on any route in the A. H. A. system.

Weather bureaus already are assisting materially in collection of road information in some districts, and this source of help will be cultivated. In Kansas City Patrick Connor, weather observer, gets information daily from his weather reporters on condition of roads in eastern Kansas, western Missouri, northern Oklahoma. This information is given to inquirers, and is available for the local offices of the A. H. A. Frank A. Davis, secretary of the A. H. A., is securing from local members of road associations names of members who will report daily on road conditions to the local weather reporters, so that road data can be telegraphed with the weather report.

The directors of the Associated Highways of America in session in Kansas City April 10 approved a plan for an organization department of the association to be operated under the direction of the secretary. The department will assist highway associations affiliated with the A. H. A. in perfecting and financing their organizations. There are now thirty associations in the A. H. A., many of which are thoroughly organized; others, however, need help to get members and funds, and to put the work on a strong basis throughout the length of their routes. The A. H. A. itself operates on a small budget, paying no salaries, but stimulating the member highway associations to activity and acting as a clearing house for co-operative work.

GOOD ROADS MOVIES

Washington, April 14—The Government is taking up the good roads movie idea which has figured so prominently in various state bond issue campaigns as an item of propaganda for highway development. The War Department has 1,000,000 ft. of negative representing every phase of America's part in the war, little of which has been released, and this will be used to show road-making in France under fire, difficulties of transportation, etc. Then the films will branch into road construction in this country. Government films are to be supplemented by others from the N. A. C. C. and different organizations. It also is planned to establish a highway reel exchange system, with Governmental bureaus in foreign countries.

GASOLINE RUN MAY 30-31

Los Angeles, Cal., April 11—Already plans are under way for the third annual Los Angeles-Yosemite Valley gasoline economy run. The dates selected for this year's event are May 30-31. The roads will be in better condition then than later as they will not be cut up by heavy traffic. These runs have been quite successful in the past, and usually fifteen to twenty cars have participated. There always has been a bone of contention, however, because the gasoline economy is determined on the ton-miles basis. The result is, weight is a big factor and dealers have been entering closed models carrying capacity loads to increase the weight. Some way may be decided upon to overcome that trouble this year.

TAX BASED ON WEIGHT

Lincoln, Neb., April 12—Nebraska has passed a law requiring motor cars to be taxed according to their weight. This is the the second state to pass such a measure. Washington, as reported elsewhere in this issue, was the first.

PERSHING HIGHWAY PLANNED

Washington, April 14—The Department of Labor plans to construct a highway to be known as the Pershing highway across the continent from New York to San Francisco, touching various places connected with the life of the commander of the American Expeditionary Forces. A temporary association has been formed for this purpose, and it is believed all the states will co-operate. A preliminary meeting was held in Lincoln, Neb.

The approval of Congress will be necessary, and appropriations made by Congress. Nearly 800 road projects have been approved in various states, and $21,000,000 is now available for state roads, according to the Federal Road Aid Act by which the Government allows the individual states as large an amount as the states themselves appropriate for road construction.

Nebraska has taken the lead in the Pershing idea and also has thirteen road projects of 388 miles that have been approved at a cost of $809,401.43, of which $320,206.66 will be from the federal funds. New York state has received federal approval for thirteen projects of 61 miles at a cost of $1,201.85, and California has had approved six projects covering 96 miles at a cost of $1,290,613.84.

ROAD MATERIAL FREIGHT CUT

Washington, April 12—The Railroad Administration yesterday ordered reduced rates on road-building materials for Federal, state, county or municipal work. All railroads were authorized to cut, without filing tariffs, 10 cents a ton from regular rates exceeding 40 cents a ton on all shipments of broken, crushed or ground stone, sand and gravel, slag, shells, chatts and cherts where the benefit of the reduction would accrue to the Federal, state or local governments.

The action was taken after conference with the Departments of Agriculture, Commerce and Labor, all of which are taking part in the road-building campaign and regard it as an important feature of the re-adjustment period.

Lower freight rates on road-building materials will reduce materially the cost of highway construction and should hasten the work in the different states for which funds already are available.

REORGANIZE HIGHWAYS

Washington, April 11—The Highways Transport Committee of the Council of National Defense has been reorganized to include direct representation from the Office of Public Roads, Department of Agriculture; the Bureau of Markets, Department of Agriculture; the Postoffice Department and the Department of Commerce. The committee as reorganized comprises:

John S. Cravens, Council of National Defense, chairman.
James I. Blakslee, Fourth Assistant Postmaster General.
J. M. Goodell, consulting engineer, Office of Public Roads.
James H. Collins, investigator in market survey, Bureau of Markets.
R. S. MacElwee, second assistant chief, Bureau Foreign and Domestic Commerce.
Charles W. Reid, executive secretary.
G. B. Clarkson.

The committee will be assisted by the Highways Transport Committee advisory board, comprising:

William Phelps Eno, Washington, D. C.
Prof. Arthur H. Blanchard, New York.
C. A. Musselman, Philadelphia, Pa.
Raymond Beck, Akron, Ohio.
John T. Stockton, Chicago.

Special co-operation and attention will be given to the short haul problem as connected with the U. S. Railroad Administration and rural motor express as related to interurban electric line and waterways traffic.

CHAMPION ASSUMES TAX

Toledo, Ohio, April 11—The Champion Spark Plug Co. has notified its jobbers throughout the country that it will assume the Federal excise tax on its spark plugs from Feb. 25 and that they need not figure this on sales to their customers.

TRI-STATE TRACTOR TRIALS

Memphis, Tenn., April 11—The tractor is getting considerable impetus in this vicinity as a result of the Tri-State tractor demonstration, which began here the 8th. The demonstration will last through Saturday. Plowing is done between 10 and 12 a. m. and 2 and 4 p. m. Originally it was decided to have only a three-day show, but the big crowds and the enthusiasm shown has caused the management to add two days.

Ten tractors are at work in the field, which is reached easily by car line. The concerns backing the demonstration include the Oliver Chilled Plow Works; Inter-

national Harvester Co., Titan and International tractors; Larimer-Burget Bridge Co., Nilson tractor; Auto Sales Co., Cleveland tractor; Evander-Williams & Co., Parret tractor; Graham-Merrin Co., Fordson; Holt Mfg. Co., caterpillar tractor; McBee Engine & Implement Co., Lauson tractor; and the Murphy Machinery & Equipment Co., Allis-Chalmers tractor.

TRACTOR DATE FOR NORTHWEST

Aberdeen, S. D., April 14—Special telegram—The week of Aug. 18 is definitely set for the Northwest tractor demonstration at Aberdeen. It will be the only Northwest demonstration officially sanctioned by the national association this year. The demonstration will be conducted under new code rules now being formulated by the tractor division of the National Implement & Vehicle Association.

SALES TO U. S. TAXED

New York, April 11—It is likely the Internal Revenue Bill will hold that sales of cars and trucks to the Government, or to the various States, are not exempt from the new tax. Under neither the old nor the new law are there any provisions specifically exempting the Government. Under the old law, however, Government purchases have been held to be exempt. Under recent interpretations of the new law, such sales apparently are not exempt. It is pointed out, however, that when dealers are approached by a state regarding the purchase of a car the dealer may pass the order along to the factory and act as a commission man, instead of taking title to the car, and then resell it.

MONTREAL HOLDS SHOW

Montreal, Canada, April 12—The show which closed here tonight was an excellent example of what can be done in making a show successful despite unfavorable circumstances. The local trade is proud also to have staged the only motor show in all Canada this year. The proceeds are to go to the Children's Memorial Hospital.

Dealers report excellent results, particularly as regards trucks. The Cleveland Tractor Co. had a large exhibit. However, the show as a whole was more a truck show than otherwise, commercial vehicles predominating.

NEW YORK-CHICAGO CONTEST

Chicago, April 14—The long-promised inter-city reliability run in which dealers and owners from Chicago, New York and other cities were to compete seems probable this year with teams from New York and Chicago as contestants. According to the plans announced by the Chicago end of the contest Friday, there will be two teams from this city, one representing the Chicago Automobile Club and the other the Chicago Athletic Association. There probably will be ten contestants from each club, and the run will include the annual inter-club contest between the Chicago organizations as well as the fight between the teams from the two cities. The date has not been set definitely but probably will be June 13—14, and the route will be from New York into Massachusetts and return to New York.

Road Council to Push Townsend Bill

Will Work for Federal Highway Commission and National System

CHICAGO, April 11—A national system of interstate highways and the creation of a Federal highway commission are the two objects of the Federal Highway Council organized in Chicago Tuesday. This movement was launched at the highway congress here in December. Since then it has been endorsed by more than 700 organizations. The new organization will act as advisory to civic and governmental bodies in all states. One of the first things the council will give its attention to is the passage of the Townsend bill now pending in Congress, which provides for an appropriation of $425,000,000 for highways. More than 720 organizations have endorsed this bill which provides for a Federal highway commission to control highways and highway construction, and the Highway Industries Association has received 365 acceptances of membership for the Federal Highway Council which will endeavor to co-ordinate the efforts for national highway development.

Some opposition has developed to the Townsend bill also, there being some objection on the grounds that the bill would take away the control of road building entirely from the states and that the work of the various organizations would be superseded by national control. Opponents of the bill claim to have the support of President Wilson, Secretary of Agriculture Houston and the highway officials of nineteen states.

The officers of the Federal Highway Council are: Chairman, S. M. Williams, president of the Highways Industries Association; vice-chairmen, T. Coleman du Pont; David Jameson, president A. A. A.; Charles Clifton, president N. A. C. C.; Louis J. Hill, Great Northern Railway; A. H. Blanchard, president American Road Builders' Association; and C. F. Adams, president Associated Highways of America. H. G. Shirley, secretary of the Highways Industries Association, is secretary-treasurer.

Inventory of U. S. Motors

WASHINGTON, April 15—Special telegram—That no war trucks or cars will be offered to the public by the Government and very few to the manufacturers is indicated by the inventory being conducted by the War Department. Although not yet complete, this indicates about 30,000 trucks and 5000 cars. The latter, mostly Fords, will be surplus above needs of War Department divisions but not counting what other Government bureaus will require. After determining the surplus definitely the War Department will require requisitions from other Government bureaus and then offer the remaining trucks and cars to manufacturers at reasonable figures. If any remain, these will be sold to the public.

As Government bureau requisitions already total 25,000 trucks and several thousand cars it is expected few trucks and cars will remain to be offered to makers and practically none for the public.

PIERCE-ARROW SALES INCREASE

Buffalo, N. Y., April 11—Gross sales of Pierce-Arrow increased about 27 per cent during the year ended Dec. 31, 1918, or from $32,565,908 in 1917 to $41,354,439 in 1918. In this period the company produced 8635 vehicles, of which 1168 were cars and 7467 were trucks. In 1917 the company produced 7703 vehicles, of which 2532 were cars and 5171 were trucks.

G. M. PROFITS INCREASE

New York, April 12—Combined profits of General Motors and its subsidiaries before deducting Federal taxes for 1916 amounted to $45,541,726. Net profits show an increase of $26,127,754 over the previous year. Net sales of all companies were 246,834 cars, valued at $326,044,755. The company's assets increased $165,699,611 during the year. These increases include holdings in real estate, approximately $46,000,000; investment in Liberty bonds, $27,000,000; value in inventory, about $44,000,000; due from Government on war contracts, $7,000,000, etc.

BRIGGS WITH SINCLAIR

Chicago, April 14—George T. Briggs, a veteran of the parts business and widely known throughout the trade, is now associated with the Sinclair Oil Refining Co. with headquarters in Chicago. Mr. Briggs until recently was sales manager of the Wheeler-Schebler Carburetor Co., occupying that position for eleven years.

NEW CHICAGO TIRE CONCERN

Chicago, April 14—Several men well known in the automotive trade have formed the Mileage Tire Co. and will represent the Western Vulcanizing Mfg. Co. in this territory. Herman J. Staebler, formerly branch manager for Reo, is president; L. C. Reid, secretary; H. T. Flory and A. H. Olsen, formerly in the motor car advertising department of a local paper, secretary and treasurer respectively; and John Weilgot, with the same paper until he joined the Navy, auditor.

SPEEDWAY MEN IN TRADE

Chicago, April 14—Two former racing men have combined forces to enter the motor car trade in Chicago. One of these is Arthur J. Hill, formerly American representative for the Peugeot in New York, who was responsible for bringing Dario Resta to this country and was his manager during Resta's invasion of American speedways. He also directed the fortunes of the Hudson racing team in 1917.

As a partner Hill has Felix J. McShane, builder and manager of the Omaha speedway and Omaha distributer for the Mercer and Hupmobile. The McShane-Hill Co. has taken on the Liberty and Biddle.

Business Rushes Dealers in Golden West

Owners Take More Than 100 Cars on an Average Each Day

LOS ANGELES, Cal., April 11—So rapidly has the demand for motor vehicles increased in southern California that the reports show an average of 125 new cars are being placed in the hands of owners daily. During February 1754 cars were sold. In March the total was 2425. If the present rate continues throughout April, this month will approximate 3,200. Commercial vehicles also are making tremendous gains, 383 being registered in March. Electric cars have become an almost negligible quantity, as but five were registered in February and March.

Los Angeles is the distributing center for ten counties, and this territory embraces what is known as southern California. While vast in acreage, these ten counties do not present the sales possibilities ten counties would in almost any state east of the Rockies. In some sections selling is restricted to a remarkably small population, comparatively speaking, and the fact there are as many motor cars sold as are is due to the intensive work of the dealers. In southern California life is not considered as worth while if one does not own a car.

There has been a lot of fine-tooth-combing of the territory to dig up 100 car sales daily, but at the same time it can be said truthfully that there has been more cash buying in the last two weeks than at any other period for more than two years. This is a good indication, but it is feared the Victory loan may have some bearing, as the Liberty loans of the past always slowed up business.

During March the number of Buicks, Chevrolet and Dodge Brothers cars sold exceeded 200 each, and the new Fords registered 607. The Oakland, Overland and Studebaker all passed the 100 mark during the month. Among the higher-priced cars the Cadillac easily ran away from its field with a registration of sixty-eight. Only one Locomobile was registered, five Pierce-Arrows, eight Marmons and seven Packards. In more nearly the average price field, the Chandler and Hudson put up a terrific battle, the records giving Hudson forty-four sales and Chandler one less. The Nash has been coming to the front rapidly in this territory, and fifty-one sales were reported last month.

Shortage Is Serious

Selling cars is a mighty fine business, the dealers say, but after having practically no business for several months now that indications are favorable an actual car shortage is staring distributers in the face. Some of the dealers who hustled like blazes to get rid of their stock in anticipation of changed models and quantity production are now anxiously holding the bag. They have orders on file but cannot get cars to fill them, and the competitor who can bring enough influence to bear on his distributer to get a car is a constant menace as customers cannot be stood off indefinitely. The situation is becoming serious. A canvass among distributers to-day revealed it to be as follows:

Hawley, King & Co., Oakland—A train-load shipment is en route to us but we have orders on hand for twenty-six carloads. This shipment will leave us with only a two weeks' surplus, and there is not another carload rolling. The summer months look dark.

Earl V. Armstrong, Inc., Chandler—We are entirely sold out of everything but a few touring cars. Have to borrow closed cars from owners to demonstrate. Retail dealers are clamoring for cars.

Greer-Robbins & Co., Hupmobile and Chalmers—We have more than 100 Hupmobile orders on our books and not a car to deliver. We were better stocked on Chalmers but they are cleaned out now.

Ralph Hamlin, Inc., Franklin and Scripps-Booth—There seems to be no chance of us getting enough Franklins to meet the demand. The factory cannot build cars fast enough. We are in a little better shape on Scripps-Booth but the supply won't last long.

J. W. Leavitt & Co., Oldsmobile—We cannot fill orders on six-cylinder models. The only deliveries we are making are on cash business. The demand for eights will rid us of stock soon. Shipments on the way will help but slightly.

Howard Auto Co., Buick—For more than three months we have not had enough cars to catch up with the orders. Sub-dealers are literally begging for cars and we can't do anything for them.

Don Lee, Cadillac—Our advertising calls attention to a shortage of cars being in prospect and deliveries are being made in rotation.

Albertson Motor Car Co., Dodge—Cutting out free service entirely has not diminished the demand. We are far behind in deliveries.

Maxwell & Hoffman, Studebaker—Our business has been wonderful. We are using every means possible to get cars but are behind on deliveries.

Chevrolet Branch—We are almost keeping pace with orders but the Oakland factory is working day and night to keep up.

Harold L. Arnold, Hudson—Two carloads stand between us and nothing. The only models we have been getting were closed jobs. The demand for Maxwells and Essex is going to bring about a shortage in these lines.

Troy Motor Sales, Nash—We are not getting any stock. Sales have been growing each month.

Apperson Motor Car Co., Apperson—The stock of standard models has been exhausted. A few anniversary models is all we have.

International Mack Corp., Mack trucks—Every time we get a shipment we have to draw lots to see who gets the trucks. Best business in history. The first three months this year show an increase of 500 per cent over the same period last year.

Some of the other distributers are entirely out of one or two of the most popular models. Factories sent word that there is no chance to increase allotments. The tractor dealers also are complaining against shortage.

BUSINESS GOOD? READ THIS

Boston, Mass., April 12—Returns being compiled by the Boston dealers following the show is the best indication that the men in the motor industry this year will not have to play Davy Crockett to keep the wolf from the door but may have to emulate him to keep out the horde of hungry motor car seekers.

Take the Cadillac Automobile Co. of Boston as an example. A. L. Danforth, president of the company, announced before the show that every salesman exceeding a certain quota would get a bonus. The men went to it with a rush, and as a result of show week, the Cadillac salesmen sold seventy cars at retail. The total value of the sales was $298,000, a remarkable figure when it is remembered that the Cadillac is not a low-priced car.

On top of that the company sold thirty-five used cars valued at $61,000, making a total for the week of 105 machines worth $359,000. There is a sales contest on between the men of the Boston Cadillac Co. and the agency in Philadelphia as to the total sales for this season, and the men have wagers up aggregating $5,000. At present the Boston men claim to be leading, and with the impetus of the show they feel now that they can make more bets and give odds.

LOS ANGELES ROW GROWS

Los Angeles, Cal., April 11—During 1918, the records show there were no new entries into the motor car business in Los Angeles. Those distributers and dealers who had been in business the year before anticipated a lean year and made their plans accordingly. To the everlasting credit of the motor car trade in this city there was not a single failure. Some of the agents got pretty close to the ragged edge and others admitted they were not making money but none quit. Now they are glad they did not quit, as a good selling season is anticipated.

Since the first of the year several new agencies have been established, and it now looks as if there will be a resumption of old-time activity along this line. Probably the most important change that has been made was in the establishment of the Maxwell-Hoffman Co. as representative of the Studebaker line to succeed the factory branch.

The B. F. Shields Co. has been organized and takes over the distribution of the Lexington in southern California and Arizona.

The Jones & Elsebush Auto Co. is a newcomer and will distribute Metz cars in California, Arizona and Nevada.

The Western Motor Car. Co. of San Francisco will open a branch here soon to represent the KisselKar.

An agency for the Daniels eight has been established, and a showroom and garage rented, but no cars have been received to date. It takes faith in the future to open an agency before there are any cars to sell.

The Gates-Kelley Automotive Co. has been appointed distributer for the All-American truck in California, Arizona and Nevada.

Several new accessory dealers and service representatives also have opened headquarters here.

HENSHAW'S ORIGINAL IDEA

Boston, Mass., April 12—C. S. Henshaw, head of the Henshaw Motor Co., agent for Dodge Brothers cars in eastern Massachusetts, has an original idea working among his sales force. The salesmen have the privilege of bidding for the floor day rights. Each man in turn has his regular day to be in charge of the floor. Any others may bid for the privilege of getting the floor any day, if the man who is entitled to it desires to sell his rights. The generally established price for a release is $25, but this sum does not tempt some of the men, for it is not the profit per car which acts as an incentive but rather the knowledge that the men with the best records are always in line for promotion, as the Henshaw Motor Co. is known as one that makes very few changes in its organization, thereby encouraging the salesmen to their best efforts.

THAT CAR OF LEE'S

St. Louis, Mo., April 14—Capt. Robert E. Lee has just completed organizing the St. Louis Storage Battery Trade Association with eighteen members and celebrated the event by having his car painted the richest, reddest red of any car on the streets of this city. While not quite as glaring as the fire chief's car, it is a stronger red, and you can always tell when Lee is coming. Lee's car also is notable for having more features of a composite motor car built by all lines represented in St. Louis than any other car here. Lee tried not to slight any line represented in the St. Louis Automobile Manufacturers' and Dealers' Association when he got his car. Lee is secretary of the dealers' association and also of the Accessory Trade Association.

CHALKIS TO MAKE PARTS

Detroit, April 11—The Chalkis Mfg. Co., organized during the war by Hugh Chalmers and W. C. Kiser to manufacture guns and whose war operations were brought to a sudden halt before they were well started by the armistice, will resume business by entering the parts field. The company will start the production of lock washers within thirty days and later other manufacturing lines will be added.

The present Chalkis plant has been sold to Young Brothers, furniture manufacturers, and will be used by this company in making small furnaces for homes. Nearly $500,000 worth of machinery designed for munitions work will revert back to the Government. The Detroit Culto-Tractor Co. first proposed locating in the Chalkis plant, but this plan was abandoned some time ago.

The Chalkis company will move into the downtown district. At a recent election of officers Hugh Chalmers was elected president, W. C. Kiser, vice-president and general manager and A. W. Lott, secretary and treasurer.

CLAUDEL TO BE MADE HERE

New York, April 11—The Aeronautical Equipment Co. has contracted with the Claudel Co. of France for the American rights to manufacture the Claudel carbureter. The contract calls for a minimum of 20,000 carbureters the first year, progressing through a minimum of 100,000 carbureters in the sixth year. The company expects to exceed these figures very considerably.

TO MAKE MINERVA ENGINE

Cleveland, Ohio, April 11—The Minerva Engine Co., has been incorporated here for $250,000 and will manufacture truck and tractor engines. The officers are: President, C. S. Goby; vice-president, R. K. Johnson; secretary, L. R. Long. Experiments and tests are complete, and preparations are under way for immediate production. For the present, the company will make only its model A engine. This is a 50 hp. It will be manufactured for other lines as well as tractors and trucks.

R. K. Johnson, director of engineering, formerly was in a similar capacity with the Garford Engineering Co. and the Gramm-Bernstein Motor Truck Co. He also spent two years in England studying engine design.

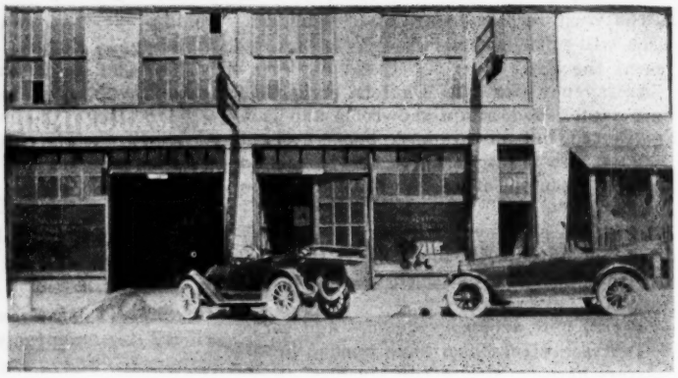
WICHITA DATE CHANGE PROBABLE

Chicago, April 12—It is likely the Wichita tractor demonstration, which was scheduled for the week of July 21, will be held instead during the week of July 14. The advance in date is likely because of land conditions. The demonstration is being staged by the National Implement & Vehicle Association.

Is This Artist Appearing in Your Neighborhood?

—Motor (in Canada)

A glaring fault of Southern service stations—too many signs by far



Not taking advantage of window—cluttered with crates and paper

Some Faults of Southern Service

Uninviting Showrooms, Poor Accessory Displays, Inefficient Shop Methods Too Often

By B. M. Ikert
Motor Age Editorial Staff

WHEN you see several mechanics repairing cars on the street in front of a service station, then go inside and find a collection of crates, excelsior and a lot of ironmongery and finally run into the office in the rear, you begin to wonder if the place is not being run wrong end to. If you could only pick up the street in front and place it in the rear of the establishment, things would be a little more logical and in keeping with modern dictates of how a service station should be run. Unfortunately a lot of the Southern service stations are run on the wrong-end-to basis.

The reason is that most of the buildings used for service stations were put up years ago and are wholly unsuitable for motor car or truck sales, service, or any branch connected with the industry. But the Southern dealers are not asleep. The majority of them are aware their places are not run according to ideal methods, and are making the best of it and selling as many cars as they can get. But service is poor generally.

Exceptions, of Course

There are exceptions, of course. In Macon, Ga., Birmingham, Ala., Chattanooga, Tenn., Atlanta, Ga., and some of the other leading cities dealers are putting up service stations that probably will not be surpassed by anything in the country. These are the live-wire dealers of Dixie. They are the ones who have gone to other parts of the country to study service, to the factories and they have the best mechanics they could get to work on the cars they handle.

But let's excuse the headline dealers and see what is happening around some of the inferior service stations. Go into any of these places and you will find about the following: Naturally you expect to get attention from somebody, but you don't get it right away. There may be several men at desks or around the cars on the showroom floor who perhaps give you a glance and then forget you for some time. Finally, they begin to realize you may want to buy a car or truck, but instead of jumping up from the desk and giving you the glad hand you are hailed from where the erstwhile busy salesman sits with "Anything I can do for you?" Lack of proper approach to a customer is one of the glaring faults of many Southern service stations. When a car comes in, the service manager, who should immediately spot it, and diagnose the trouble, very often is repairing cars himself, probably out on the street.

So many of the Southern service stations are old livery barns and present anything but an inviting appearance. The light is bad and much of the repair work is carried on right in the entrance, where most of the light comes in through a big door. The result is cars are parked in front of the building, and the mechanics have to walk back and forth from cars to building for tools and parts, losing much time, to say nothing of the way in which the sidewalk, door jambs, etc., are besmeared with grease and dirt from the constant tramping in and out.

Often the places have nothing but dirt floors, and it takes little imagination to realize what sort of service and repair work can be had in such places. Bolts and nuts dropped on the ground easily are tramped into the soil and lost. One of the pictures herewith showing the agency of the Master truck is a typical example of an old livery barn transformed into a service station. This view also illustrates another fault of many Southern stations, that of too many signs. If attempt were made at uniformity, the trouble would be more mild, but as it is there is a riot of color and jumble of signs. Note, for example, the number of times the word Master appears in this picture. It would have been just as effective to play it up once.

On the inside of these places and even in the better ones you will find many signs and pictures that hang crooked, or old canvas signs that were put up to advertise the county fair maybe a year or more ago. It would make the places look 100 per cent better if these old signs were removed and the pictures hung straight. A can of kitchen cleanser and rag would go a long way toward making the accessory showcase more attractive in many of the places. No customer is attracted to buying an accessory that is almost hidden in a dirty showcase. Instead of finding a neat display of accessories in the windows as could be done in so many instances, the owner of the place has taken advantage of the window

A case where a dealer is not taking advantage of his location. Five streets intersect at this point, and the city hall is just across the street. A three-story service station should be built here

A typical row in a Southern city. Note the cars in front

A typical Georgia peach orchard, showing the vast distances. It takes a long time to cultivate between the trees by plowboy and mule, but the tractor makes short work of it. Some of the work of the recent Dixie tractor demonstration was carried on in these orchards. Practically every Georgia farmer has a peach orchard

space as a fine location for empty crates, a few batteries perhaps, and strips of the narrow paper tires are wrapped in. Tires very often are piled in the windows, right in the sun, with no attempt to protect them or stack them neatly. Some lie flat, others lean against the pane, etc.

In the repair departments you find labor-saving devices missing. Efficient engine stands are not seen. Rather, engines are placed on a rough support made of 4 by 4's and the workman has to go through all sorts of contortions to get at certain parts easily accessible with a revolving engine stand. Take the workbenches, they are roughly made very often and could be vastly improved by covering with galvanized sheet iron and providing a board at the back to prevent tools and parts from falling between the bench and wall. These are small affairs to talk about, but when you see a man groping under a bench for a small part that fell through the cracks you wonder why they tolerate these conditions. Instead of progressive repair work as practiced by up-to-date shops, where the engine, say, is put through a well defined and progressive system of handling, the work here is haphazard. Luckily the shop foreman in most cases is a good man, but he has inferior men to work with, in many cases negro boys. The latter do not make resourceful mechanics and can do only what they are shown many times. They need watching almost constantly. This is not true of all, but we are speaking of the give-and-take service stations.

Parts are poorly kept. Only once out of a half dozen Southern cities visited did we see parts kept in steel bins, and that in one of the new places going up. Wood bins are all right, but there is little attempt at uniformity. It is not much more difficult to build a parts cabinet and have all the bins perfectly square and the joints neatly made. Such a cabinet is conducive to cleanliness and efficiency. In one office of a Southern service station we noticed a new steel filing cabinet, which, while beautiful in itself, looked entirely out of place, because of its environment—dusty desks, broken glass in partition, unpainted walls, cash register crooked on counter and other things.

Telephones are lacking. In some of the two-story affairs you have to yell from one floor to the other if you want a certain man, whereas the manager of such a place should have his men right at his finger tips with a telephone. Little attempt is made to make the visitor comfortable. There are no chairs in the showroom and if you have to wait to see a man you stand. Women's restrooms are almost unknown, even in some of the places that could afford to put them in. But all these will come in time, for the live dealers who are putting up rattling good places have thought of all these things and the dealer who holds out is going to lose, that's all.

Of course, we are sympathizing with the dealer who is doing the best he can with his present layout and who eventually will put up a new place to meet his requirements, but we have little use for the one who could with a little paint, soap and water make his place 100 per cent better and does not do so. One shop foreman told a MOTOR AGE representative when asked why better efficiency was not established in the place:

"I wanted to put better methods in the place when I came here, but the boss says he can get along all right as it is."

So there you are.

An example of street repairing, not uncommon in many Southern cities

Buildings like this are beginning to replace inferior service stations

Breaking Even on Used Cars

The Pella Motor Co. Does More —It Makes Money on Them

By Fred M. Loomis
Motor Age Editorial Staff

Pella Motor Co.

New Car Inspection on all Overland and Willys-Knight Cars

Model .....
Car No. .....
Sold to. .....
Date .....
Salesman .....

1 Adjust front wheel bearings.
2 Line up front wheels.
3 Adjust two Lock Nuts on external brakes, so that lower half of brakes does not drag and tighten down.
4 Inspect rear axle nuts.
5 Tighten body bolts.
6 Fill all grease cups.
7 Inspect spring shakels and see that they are all cattered
8 Tighten bolts in hood strip and see that hood fits.
9 Inspect generator and wiring.
10 Test battery and see as to amount of distilled water.
11 See that connections are all in proper place and tight.
12 See that throttle opens up full length of sector and full throw at carburetor
13 Fill with gas and oil.
14 Give car fair road test.
15 Quiet rear axle by adjusting pinion, if necessary.
16 Tighten cylinder head while engine is warm.
17 See that speedometer is adjusted.
18 If body shows marks too prominent, have them removed.
19 Wash car ready for delivery.
20 Inspect car in general and see that full equipment is there.

If new car is to be delivered in cold weather, remove heavy grease in transmission and put in quart of cylinder oil and kerosene and pint in rear axle housing.

O. K by.....Mechanic

These twenty things are done by the Pella Motor Co.

"FOR eight years we either lost money or did no better than break even on used cars. Then we got onto the system and since then we have been making money," said Ed. Van Gorp, one of the three partners in the Pella Motor Co., Pella, Iowa.

Like so many other motor car dealers, the Pella Motor Co. was, and still is, addicted to trading in old cars. But there is this difference between the custom of this company during the years it said it made no money reselling used cars and what it is now, when some profit is made, namely, used cars used to be sold as used cars while to-day they are sold as rebuilt cars and are resold with the company's guarantee. Furthermore, it used to be the custom to sell used cars for what they would bring; to-day the company places a real valuation on its rebuilt cars and gets it. In addition, the rebuilt cars look and are worth the price asked for them.

The plan is very simple, yet it hardly could be put into effect so efficiently by a motor car dealer who did not possess the facilities for rebuilding cars which the Pella Motor Co. has. Its shop is completely equipped to convert almost any old wreck of a car into a very presentable product.

When an old car is offered in exchange it is looked over carefully. If it appears possible to rebuild it and make anything worth while out of it, the company offers a price based upon its condition. It should be noted the company makes the price, not the customer. The company does not trade. It buys an old car and sells a new one. There's an important distinction here.

Having bought the old car, it is brought to the shop, where it takes one of two courses. Either it is scrapped completely and all used parts which have any value put into a used parts department, or it is rebuilt, and rebuilt completely.

"What is the use," says Mr. Van Gorp, "of spending $200 under the hood and offering the car for sale with a torn top? Renovate it completely. Go the limit. If the car is worth rebuilding at all, it is worth rebuilding right. Spend all the money on it necessary to make it look usable and salable. Then put a price on it high enough to cover the buying-in price, the rebuilding cost and the profit, put a thirty-day guarantee on it and sell it. During 1918 our business was almost fifty-fifty between new and rebuilt cars, and we made good money in both departments."

The Pella Motor Co. is quite some concern for a town of 3000 inhabitants. It occupies a commodious and substantial building, which, by the way, was built originally for the implement business, and the company sells Overland, Hudson and Cadillac cars—with the emphasis on the Overland—Republic trucks and the Moline-Universal tractor. The company consists of Ed. Van Gorp, Earle Black and Fred Lankeman, "all hard workers," says the last named.

The first impression one gets on going into the Pella Motor Co.'s establishment is one of cleanliness and order. It's a piece of "spotless town" set down in the midst of motordom. This excessive cleanliness by no means is confined to the office and showrooms, but extends all through and around the building. Maybe not every visitor is invited outside to view the tidy condition of the backyard, but the writer was. How it is possible to keep a whole establishment, and one as busy as this one normally is, so perfectly clean and in order is a mystery, but the cleanliness and order are there, nevertheless. And the order is not the order of rigidity but is the order of habitual custom—everything is in place because it belongs there.

The company specializes on service and has a shop at the rear of the garage where a normal force of three mechanics works, equipped to give service. As stated before, the company pushes the Overland car in particular, and the shop is equipped to give special attention to Overland service. It has all the specialized machinery for doing this. As there are something like 640 Overland cars in use in the company's territory, exclusive Overland service, as far as service on motor cars is concerned, is a profitable possibility.

Of course, now that trucks, tractors and farm operative equipment have been taken on, service must be extended to include these also, and measures have been taken accordingly. It is the boast of the company that it is self-sufficient in the matter of service. Not only is the equipment of the company competent, both materially

Where the Pella Motor Co. has its place of business

and in a human way, to take care of service without an appeal to the factory, but the service given is immediate. This applies alike to cars, trucks and tractors.

As respects the last named, Earle Black is the tractor man of the concern. Having had farm experience himself, he knows how necessary prompt and efficient service is to the farmer, and he says no tractor in his territory will be laid up longer than it takes him to get to it. He also is using a truck for the delivery of tractors to the farms.

The equipment of the repairshop is complete, consisting of lathes, drills, reboring machines, hydraulic press for pressing off gears, engine stand, overhead tracks and power pulley lifts, gasoline and air cleaner for cleaning parts and the like. It is the boast of Mr. Black that his men can take the engine out of a car and have it on the stand in 40 min. A part of the equipment is an electric elevator to the second floor where the used car and new car storage departments are.

The company has a novel arrangement for oils. There are no barrels or cans standing around the shop. Instead there is, on the second floor, immediately above the shop, a galvanized tank, oval in shape and possibly 10 to 12 ft. long and maybe 20 to 24 in. in cross section. This tank is divided by metal partitions into several compartments and is covered entirely by a close-fitting metal cover. Oils of various kinds and alcohol are kept in the compartments and fed to the shop below through pipes, gravity giving sufficient pressure.

The new parts department is located on a sort of mezzanine floor above the office. This may seem a little inconvenient, but space is saved on the main floor by this plan. A very complete stock of repairs is kept, which now is being augmented by the addition of a line of repairs for tractors.

Used Parts Department

But the most unusual feature is the used parts department. This is located on the second floor and in superficial area is considerably larger than the new parts room.

Used parts are sold at 25 per cent off the list, and since the department was instituted a considerable volume of profitable trade on these parts has developed. Mr. Black says:

"It is worth while because it gives us an outlet for old cars which hardly are fit to overhaul and rebuild and which otherwise we might be tempted to sell, thus flooding our territory with second-hand stuff."

Mr. Van Gorp sounds the keynote of the company's policy on service when he says that "rendering prompt and competent service is the very best possible advertising an automotive business can get because it sells equipment," and in justification of the very complete stock of spares carried he says:

"It isn't what you make on parts that's as important as having them on hand when they've wanted—that's service.

One of the illustrations used herewith is a list of the things the Pella Motor Co. mechanics must do to an Overland car before it is delivered to the customer. The same care is exercised with a tractor.

"You see," says Mr. Black, "some one of those 25,000 or so employees at the factory may have overlooked some little thing which also gets by inspection. That little thing, if we don't detect it here and correct it, will cost us trouble and money. So we make as sure as we can that everything is all right before the customer gets his goods."

That, too, is service—the most up-to-date and enlightened service—preventive service.

Good Roads Victory Sweeps Michigan

State Votes 4 to 1 for Bond Issue of $50,000,000

DETROIT, April 11—Michigan voted overwhelmingly in favor of the $50,000,000 good roads bond issue Monday, the project carrying in nearly every precinct by a 4 to 1 vote. From the beginning of the good roads campaign until the very end there was no organized opposition. True, in two or three counties farmers who could see no direct benefit organized dirt roads associations and conducted a feeble fight. But the press ridiculed the "dirt road" men to such an extent opposition was smothered before it started.

The campaign for good roads was brilliant and complete in every detail. It was directed by the Michigan State Highway Association and backed by every motor club and chamber of commerce in the state. The project was the largest good roads movement to come before the voters of this state. It authorizes the state to issue bonds not to exceed $50,000,000.

Michigan has 4800 miles of trunk line roads. Of these only 1800 miles are improved. Of the remaining 3000 miles 1000 have been developed but need to be rebuilt, while 2000 miles never have known improvement.

The measure insures a complete trunk line system in every county. The trunk line system is well developed in Wayne, Ingham, Genesee, Calhoun and one or two other counties, but Michigan also has counties in which not a single mile of the trunk highway has been improved. The campaign was conducted through the press, circulation of literature, advertising agencies, social, civic and rural clubs, by public speakers and through moving pictures.

Those persons best acquainted with the present condition of Michigan roads, es-

System of trunk-line roads in Michigan made possible by bond issue

pecially those that have been improved, know that there are many miles which cannot be maintained economically much longer and which soon will have to give place to roads of more permanent type. Present traffic conditions have stressed them to the breaking point. For this reason it was readily apparent the $50,000,000 bond issue would meet a stringent need.

The bill carrying the bond issue provides that the counties shall bear from 10 to 50 per cent of the cost, the amount paid by the state being greatest in the poorest counties and least in the richest counties. The amount expected from the several counties is in proportion to their valuation per trunk line mile and in accordance with the following schedule:

County valuation below $50,000—10 per cent.

County valuation between $50,000 and $75,000—15 per cent.

County valuation between $75,000 and $100,000—20 per cent.

County valuation between $100,000 and $150,000—25 per cent.

County valuation between $150,000 and $200,000—30 per cent.

County valuation between $200,000 and $300,000—35 per cent.

County valuation between $300,000 and $400,000—40 per cent.

County valuation between $400,000 and $500,000—50 per cent.

The best estimates state engineers can make put the amount Michigan should receive during the next ten years from Federal, state and county sources for roads at not less than $100,000,000. This takes into consideration the Government's recent appropriation of $200,000,000 and the $75,000,000 appropriation by Congress in 1916. Michigan's share in the last appropriation will be nearly $6,000,000, which must be met by an equal sum from the state. The bond issue insures the building of 3000 miles of trunk roads in the next ten years.

Plan of Organization

Michigan's plan of organization for the good roads campaign was simple but thorough. Every county was organized with the necessary committees. Every county organization was an exact replica of the state organization. This carried the gospel of good roads into every township and school district.

Campaign headquarters were at Lansing, the capital. Every county seat had its branch headquarters. The Michigan Good Roads Association was the foundation of all effort. Every county was asked to contribute to the campaign fund from $50 to $4,000. All responded generously, and the campaign fund was approximately $100,000.

The publicity committee was divided into two divisions—press and moving pictures. Through seven classes of organization the campaign was carried to the door of every business interest in the state. These seven were:

The state grange, farmers' clubs, gleaners.

State council of motor clubs.

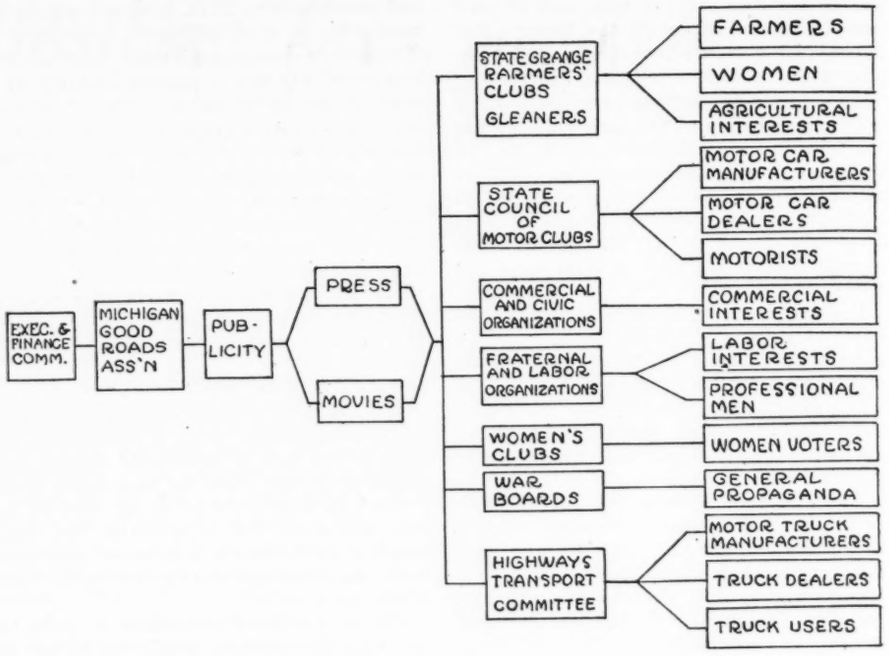
Commercial and civic bodies.

Fraternal and labor organizations.

Woman's clubs.

War boards.

Highway transport committee of the good roads association.



Plan of organization which won good roads funds for Michigan

The state grange, farmers' clubs and gleaners carried the campaign to the farms and all agricultural interests. The state council of motor clubs reached car maker, dealer and owner. The commercial and civic organizations covered the commercial interests of the state. The fraternal and labor organizations did their work among the labor interests and professional men. The woman's clubs dealt with the new woman voter. The war boards conducted a general propaganda. The highway transport committee went to the truck maker, dealer and owner.

The moving picture was highly successful. It was directed by Henry A. Gutherie of Chicago, with the co-operation of the Ford Motor Co. and its weekly film. The good roads film reached 500 theaters in the state weekly. The state staged its own Michigan motion picture production. It consisted of a 1000-ft. film entitled "The Road to Yesterday and To-morrow," furnished free to exhibitors.

ANOTHER BOOST FOR ROADS

Chicago, April 11—One of MOTOR AGE's subscribers told us this: Rock county, Wisconsin, voted 3 to 1 to issue $1,500,000 in bonds to build at once with concrete the 100 miles of state truck highways in that county.

ROOSEVELT HIGHWAY PLANNED

Rochester, N. Y., April 11—To further the plan for the construction of a highway in memory of Theodore Roosevelt, representatives from various counties of New York met here last week and formed a Roosevelt Road Association. The road as projected will be from Montauk Point, L. I., up the Hudson valley to Albany, thence through the Mohawk valley, to Utica, Syracuse, Rochester, Buffalo, Erie, Cleveland, Toledo, Chicago, terminating at St. Paul and Minneapolis, Minn.

The plans for the construction under way now will make the road 22 ft. wide, and strong enough to sustain 20 tons on four wheels, with a radius of curves 900 ft., with no grades exceeding 5 per cent. The length of the road would be about 1425 miles in seven states. About 500 miles of this would go through the Empire state, and it is thought if this section can be built the other states will follow the example.

Under the present law, it is possible to accomplish that within three years because within that time there will be payable to New York from the Government about $14,000,000 for construction of roads within the state, provided the state furnishes an equal amount to go with the Federal aid; that is, there will be available within three years, $28,000,000.

The following officers were elected: W. W. Armstrong, Rochester, president; Charles T. Chapin, Rochester, first vice-president; George C. Diehle, Buffalo, second vice-president; F. W. Sessions, vice-president of the State Motor Federation, third vice-president; Peter G. Ten Eyck, Albany, fourth vice-president; J. Y. McClintock, engineer of Monroe County, secretary; Charles J. Brown, treasurer of Monroe County, treasurer.

MOTOR VEHICLE DEPARTMENT

Harrisburg, Pa., April 11—A department of motor vehicles is provided for by a bill introduced into the senate by Senator Dix of Philadelphia. The measure provides for a commissioner at $5,000 a year and a deputy commissioner at $4,000. It would permit the establishment of branches in Philadelphia, Pittsburgh, Erie, Scranton and such other cities as the commissioner may deem advisable. These branches would be in charge of an agent with a force of employees found adequate to conduct the business of the department. The agent would be paid by fees, with a minimum limit of $2,000 a year.

The bill also provides for a chief inspector and a corps of inspectors. License fees for cars would remain the same as at present, but fees for trucks would be increased. Car speed is regulated.

Motor Car Body Wiring

Neatness and Care Essential in Installation on Closed Model

By M. R. Jack Crosley

BODY wiring of a car is much like house wiring though not in some instances as complicated. Nevertheless, there are two items which are essential to both, either house wiring or body wiring, namely, neatness and care. Neatness in the installing of house fixtures, switches, etc.; likewise the fixtures, etc., for the inclosed body. Care in making your connections, the right size of wire to use and, most important of all, guarding against mechanical injury. It is to the last named item "mechanical injury" that the writer wishes to draw the reader's attention. As a general rule one finds the following electrical fixtures on closed cars: Entrance, or step, light at the doors, dome or ceiling light, outside pillar lights, corner lights, cigar lighters, etc., and the respective switches which control them.

Wiring Closed Cars

The body of a closed car has to have its wiring done before the body is upholstered. Usually the body is prepared for this wiring as follows: Grooves or channels have to be cut on the floor of the body to wherever the wires are to be run. The groove should not be less than ¼ in. wide by ¼ in. deep, at least deep enough for two or more wires. The size of the wire for ordinary purposes should be about No. 16 and stranded, which also makes it easier for the wireman to handle. The engineer or electrician responsible for the lay of circuits first should co-operate with the body builder in regard to the grooves to be cut, which can be done at the same time the timber is being fashioned for the body. The idea of these grooves is obvious. They afford protection to the wires from mechanical injury which may come from such sources as walking on the wires on entering the body or moving around or from baggage.

All cars of this class usually have a carpet, but when the car is in for repairs or overhauling the carpet, cushions, seats, etc., are removed from any dirt or grease that may be around. Without these grooves the wires would be exposed to injury. And yet another point should be borne in mind when running the wires for overhead, that is, for the dome light and from thence to the switches which control it. The wires run along the roof of the body. This is best done by drilling small holes, say, $\frac{3}{16}$ in. in diameter and about 2 in. apart through each rib of the roof. This will insure the wires from flapping against one another or against the roof when the car rolls or bumps. The writer has found that the easiest and quickest way to wire up such a body is to have a roll of wire on a revolving spool, Fig. 1, and lay the wires loosely and stretch them roughly along the grooves and corners to give the approximate length of each. This done, he commences to lay and fasten the wires permanently in the grooves, using staples of various sizes, according to the number of wires to fasten. in some places there are two wires, in other places as many as four.

A better way to hold the wires down in their places would be to use small leather strips about 1 in. long and ½ in. wide and tack them down across the wires and groove, preventing the wires from rising above the level of the floor. As a test and a complete finish to the wiring, two dry cells with an ordinary bell in service, Fig. 2, answers the purpose for ringing out the circuits for short-circuits caused by staples or wrong taps, etc.

If this test is not made, it is difficult to remedy the work once the body has been upholstered. One point in particular the wireman should guard against, namely, the trimmer's tacks, the cutting of the cloth and the screws for curtain rods, etc. The trimmer's tacks sometimes cause a great deal of trouble not only to the electrician but to the trimmer himself as he has to rip up his work in that section where the short-circuit exists.

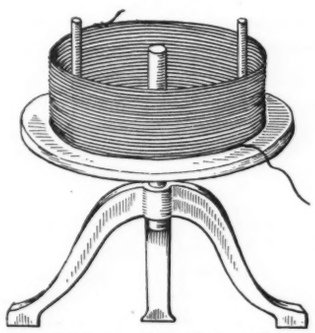


Fig. 1—Roll of wire that makes work handier

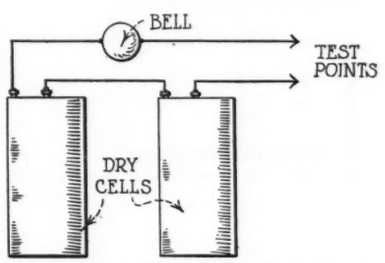


Fig. 2—Apparatus used for test and complete finish to wiring

Wiring Diagrams

The two diagrams, Figs. 3 and 4, are self-explanatory. Fig. 4 is the wiring diagram for dome light, door light and switches and two extra three-point switches to control corner lights from either front or rear of car. Fig. 3 is the wiring diagram for dome light, door lights, door switches, two three-point switches and a single-pole switch to open the door light circuits though the tail-light is on. The door lights are connected to the tail- and sidelight circuit on the light switch. The fact that the wiring is all concealed by the upholstering does not give an excuse for slovenly work. Good work and care last longer. The wiring should be confined to the inside of the body wherever practicable and not underneath, exposed to mechanical injury from the chassis frame. In truck wiring the case is different, as the truck body, of course, is different. Armored wire, single or duplex, generally is used. Fig. 5 gives one way of light circuits with generator included for battery charging.

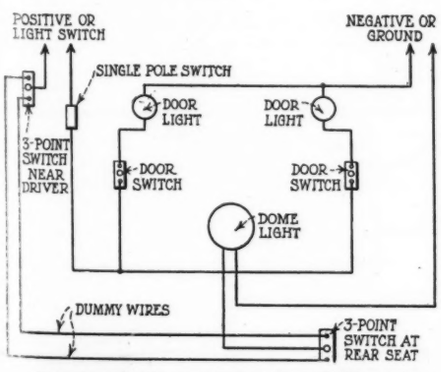


Fig. 3—Wiring for dome, door lights and switches

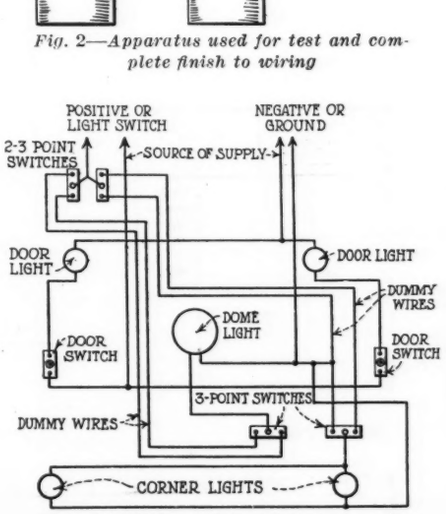


Fig. 4—Wiring that uses two extra switches for corner lights

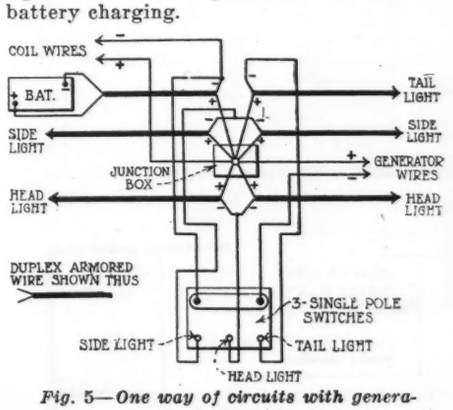


Fig. 5—One way of circuits with generator for battery charging

Garage Planning
Service Station Arrangements

No. 33

Q—Please send us sketch of garage for corner lot 100 by 140 ft. with office, stockroom, accessories and showroom to be located in the center of the building.—Neodesha Motor Co., Neodesha, Kan.

You have asked for the showroom unit in the center of the building, and therefore it has been placed there, but we cannot understand why, since you have a corner lot, you do not place this unit in the corner, where it naturally belongs; by so doing you may have a window on the side of your showroom as well as the front. You also will have window lighting for your office. It should be plain that, if you so desire, the whole showroom unit may be placed in the corner with practically no change.

Offices, accessory stockroom and toilets are intended to be illuminated and ventilated by skylights.

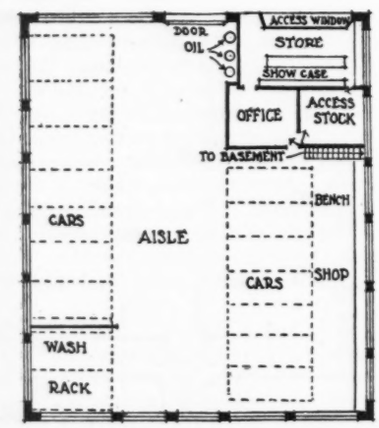
There was no way for us to determine just how large a shop you desired, so it was necessary for us to be guided entirely by our own judgment. If you should find it not large enough, it can be extended to the left as much as desired.

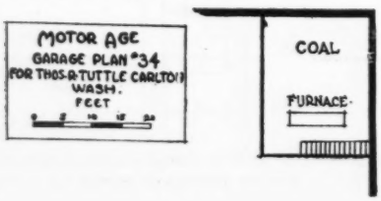
Please note that entrance to the shop is through a series of sliding doors, this feature permitting a car to be run directly into any space it is to occupy, without the necessity of maneuvering.

No. 34

Q—What would it cost to build and equip a garage to handle most of the repairs on the lower-priced cars which are used generally in a farming country? Lumber costs $16 a thousand feet, either fir or pine.—Thomas R. Tuttle, Carlton, Wash.

It is practically impossible, much as we





MOTOR AGE is receiving many inquiries for garage plans which do not give sufficient information to permit an intelligent reply. There are certain things which should be known to lay out the proper plan for a garage, and inquiries are urged in asking for such plans to be sure to include the following information:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.

should like to do so, to give you figures on the cost of building a garage in Washington. You will find that builders, even in your own locality, rarely will agree on the figures they submit on a given building. How much more difficult is it for us to give you an accurate estimate when we do not know all the local conditions?

We are inclosing a plan of a building intended principally for repair work and suggest that the most satisfactory way of learning how much it will cost to build it is to take it to some local contractor.

The plan provides an accessory store, stockroom and office. There is a shop to accommodate four or five cars, and along the opposite wall of the building is space for storing nine cars, including two on the washrack.

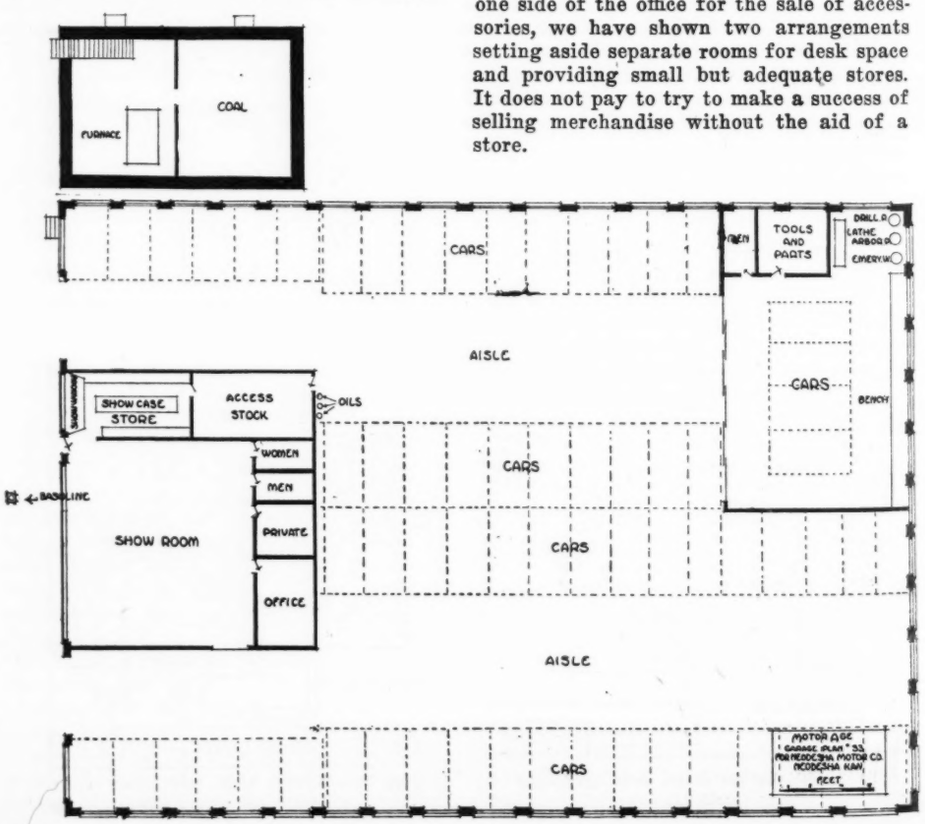
As soon as your repair business begins to grow you probably will need all the garage space provided for storage of cars waiting to be repaired or which have been repaired and are waiting for owners to call.

No. 35

Q—Attached is rough sketch showing location of lot for building a garage, to be 70 by 30 ft., one story high, with round roof and workshop in rear. A blacksmith shop, 20 by 45 ft. now stands on the front part of the lot. It will be moved back to the rear end, and 20 ft. will be used for the repairship. The entire space in the new building will be used for storage, except for a small office in the front. I should like to have a pit in the repairshop. I do not expect to handle cars as a dealer but will sell accessories. I will employ about three men.—J. E. Elsass, Botkins, Ohio.

Your plot is very small for the erecti n of a garage building, and we are not certain you will be satisfied with such a small building once you have it.

Instead of providing a shelf or two at one side of the office for the sale of accessories, we have shown two arrangements setting aside separate rooms for desk space and providing small but adequate stores. It does not pay to try to make a success of selling merchandise without the aid of a store.



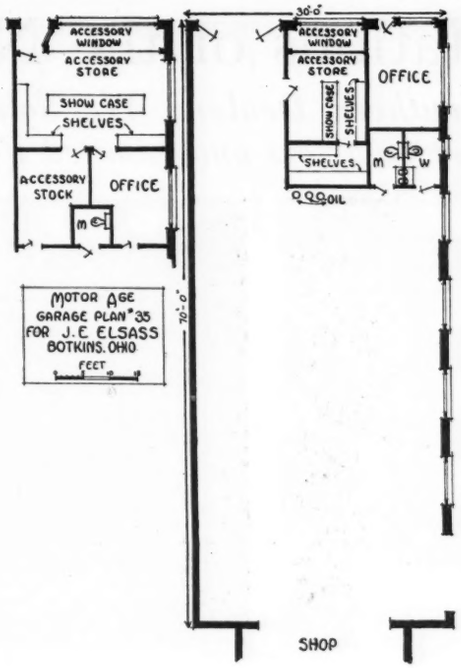
The remainder of the building is for garage storage, the small building at the rear being used for repair work. It is not advisable to follow any set system of car arrangement because of the smallness of the space. You will get more cars in if you just pack them in as they come, taking care, of course, to have the cars which leave early nearest the exit.

No. 36

Q—The attached rough sketch shows garage on which I would like to have suggestions. The lot is 68 by 152 ft., facing west on brick pavement and running back to alley. I do not know whether it would be better to cover the whole lot or to build the garage 140 ft. long, leaving 12 ft. of ground in rear in addition to alley. The front is to be of glass. There will be elevators running to basement and upper floor. I intend this to be a general-purpose garage, with a sales floor which will hold six cars and an accessory department suitable for the needs of a town of 5000. Later on I expect to add tractor and truck lines. I am planning on a small machine shop and workroom, also battery for battery sales and service. The building is to be two stories high, with basement, both with posts and without. The washrack is to be in the basement—H. B. Craycroft, Vandalia, Ill.

Your suggestion to leave a 12-ft. strip of ground is very good, since this space will come in very handy for quick service jobs during the warm months. We have placed the coal bin and boiler room under this space, so it will be convenient to the coal wagon.

Little explanation as to the details is required. On your sketch we have shown the elevator in the rear. We suggest an extra



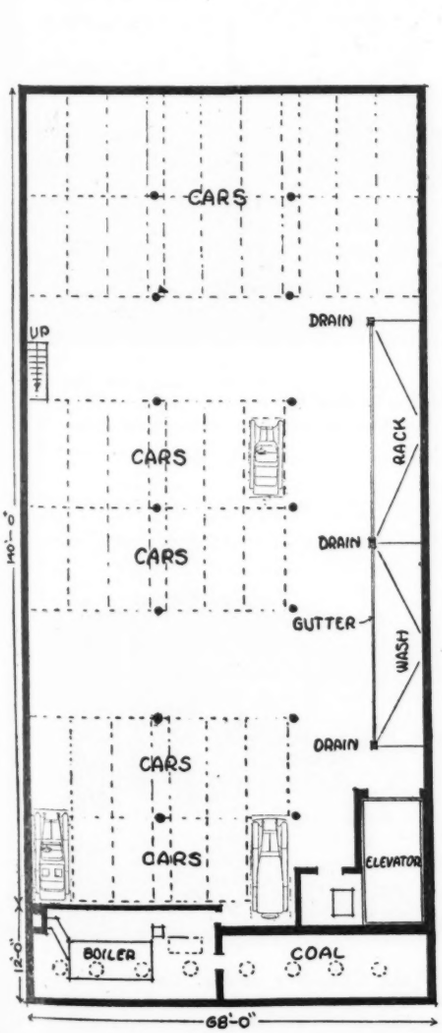
entrance be provided direct to the elevator, so cars to be repaired can be sent up to the machine shop without going through the first-floor garage. With no side entrance, it will be necessary to prevent congestion in every way possible, and there should be a rule not to allow cars to leave by the front entrance, as one in every so many is bound to meet another coming in.

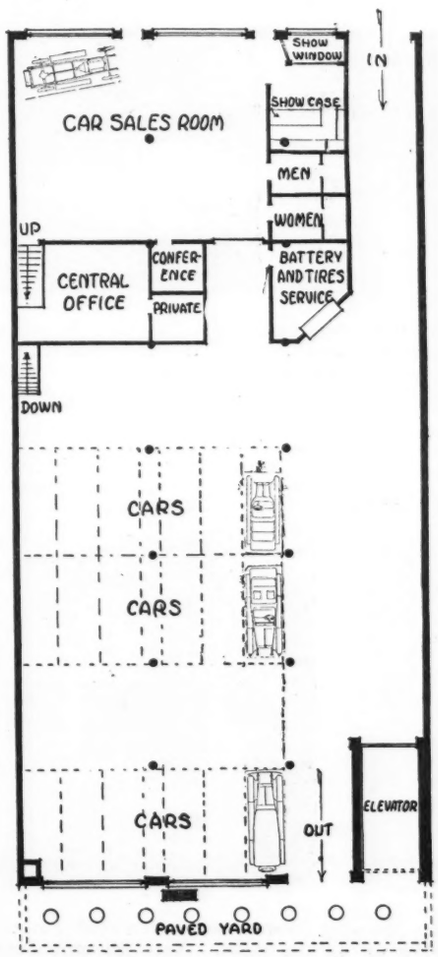
You ask for a building with and without posts. We have kept to your specifications on the second floor, but believe it unpractical to do without posts in the basement or on the first floor. Even were you to use one row of posts through the center, you have would have a span of 32 ft. and to carry the dead load and 100 lb. a square foot live load, which is about as low as is safe, 24-in. I-beams would be required, spaced about 18 ft. apart. Between these you would need 10-in. I-beams 8 ft. apart.

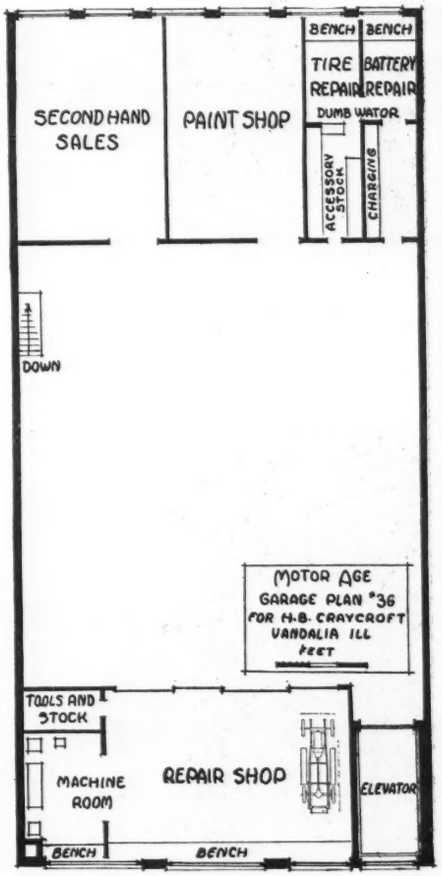
Reinforced concrete beam and floor construction would be even more massive and equally expensive, and you readily can see that the span of 65 ft. would be like building bridges across a small river.

We have arranged the posts to the best advantage in storing cars and while they seem closer than necessary longitudinally, any change would place them more in the way than they are.

By having repairshop, battery department, tire department, paint shop, etc., on the second floor, more space is left on the first floor for easily accessible storage. Also a big saving in elevator power is made, as well as the customer's time. The washrack being in the basement, it is wise to reserve this whole floor for storage, because cars can be washed and stored or washed before taking out without using the elevator, meaning more economy.

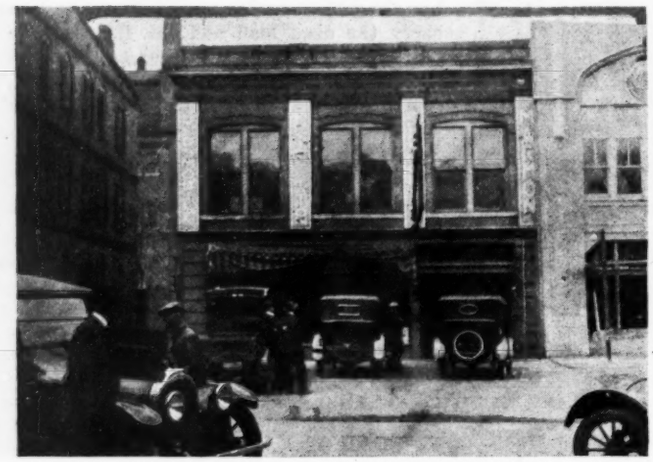


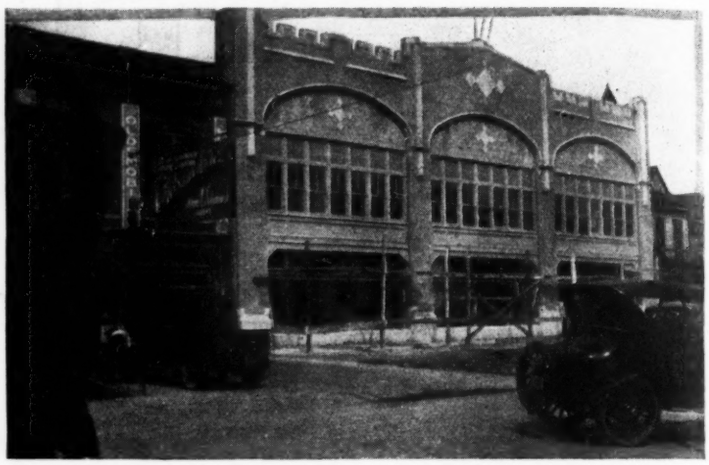




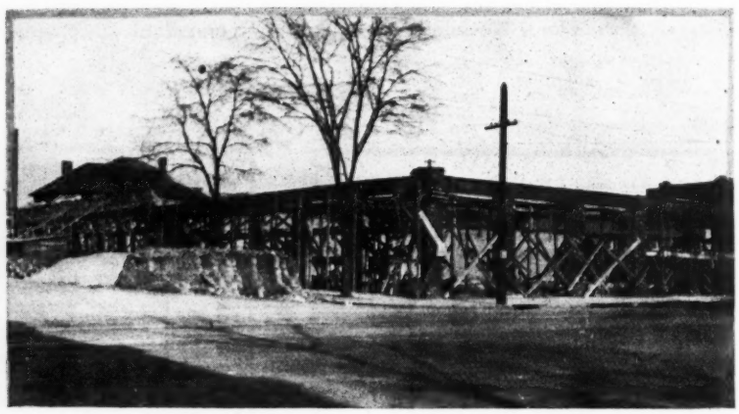
Service Stations of the New South

How Some of the Southern Dealers Are Solving the Problem of Cramped Quarters and Limited Facilities

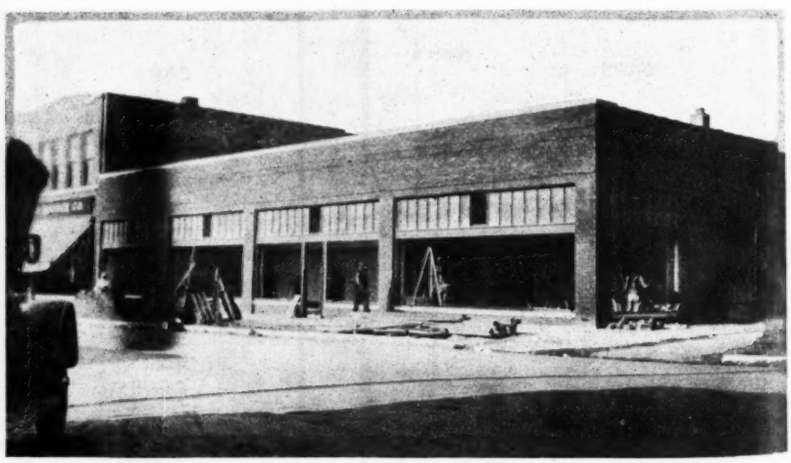




At the left is the present home of the H. J. Lamar Co., Macon, Ga., which handles the Lexington and Oldsmobile cars and trucks, also the White truck. On the right, the new building, to be done in about three weeks. The new structure promises to be as fine a layout as any in the South; in fact, rival any in the country. It has been scientifically designed and built



These views show the old and new of the Drennen Motor Car Co., Birmingham, Ala. This concern handles the Olds and Cadillac. The old building is too small, hence the new two-story building going up on the right. This covers almost half a city block and is so planned that A-1 service can be rendered. The showroom, extending clear across the building will not have a single post in it



Another view from Birmingham, Ala., showing the present crammed quarters of the Chandler dealer, on the left, and the new service station he is putting up on the right. Note the cars outside. This is typical of many Southern service stations, as in the majority of cases they are too small to handle the business. The next few years will see many beautiful and spacious service stations here

The Victory Liberty Loan

Amount—$4,500,000,000.

Interest—4¾ and 3¾ per cent, payable June 15 and Dec. 15.

Tax exemption—From all except estate and inheritance taxes, 4¾ per cent bonds being subject to Federal income surtaxes.

Records of Former Loans

First loan—$2,000,000,000; 3½ per cent, tax exempt; maturity thirty years.

Second loan—$3,000,000,000 offered; $4,617,000,000 subscribed; $3,808,000,000 accepted; 4 per cent; partially tax exempt; maturity twenty-five years.

Third loan—$3,000,000,000 offered; $4,176,000,000 subscribed and accepted; 4¼ per cent; partially tax exempt; maturity ten years.

Fourth loan—$6,000,000,000 offered; $6,993,000,000 subscribed and accepted; 4¼ per cent; partially tax exempt, with special conditional exemptions for past issues; maturity twenty years.

APRIL 21 the campaign for the Victory Liberty Loan will begin. Before that date every American citizen should be prepared to make his subscription for the largest amount of these new securities he is financially able to buy.

The reasons why he should be thus prepared are many.

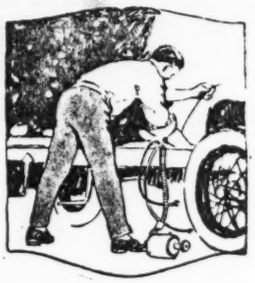
In the first place the Government needs the money now as much as at any time when the war was at its height. The cost of paying for victory has been and is tremendous. Practically the entire amount of the Victory Liberty Loan has been borrowed from the banks in anticipation of it. This has been necessary to pay the maturing bills for war material fortunately never to be used; for maintaining our Army and Navy and for bringing home and mustering out the hundreds of thousands of brave men who performed their part of the national contract to win the war. It should be enough for us that Uncle Sam needs the money now for the honorable liquidation of his debts.

Again, the successful flotation of the Victory Loan will mean the biggest boost to prosperity that we have yet had. It will do more to clear the business skies of the clouds of uncertainty than anything else. Business then will be able to go ahead under a full head of steam, with the banks relieved of the apprehension of being obliged to underwrite the securities of the Government. Uncle Sam will pay the banks back the billions of dollars borrowed the last few months, and this vast capital will be at the disposal of business. It would be difficult to measure the value to the commercial world of having the securities of the Victory loan as widely distributed as the previous loans, with the banks then having their resources available for legitimate commercial uses.

Another reason for the purchase of these securities is that they are worth the money. They will be for a short term with every prospect, according to bankers, of selling at comparatively high prices. There will be a decidedly fair rate of interest. Buyers will have an asset with the highest borrowing value of any security on the market. Business men will appreciate this.

As citizens of the United States we obligated ourselves to do certain things, and one of these was to see the war through to a finish. This will not be done until the bills of victory are paid, and the Government will not be able to discharge its obligations without the support of the whole people the same as in the four previous loans. We cannot shirk the responsibility we carry and still be entitled to the name of citizen.

Electrical Equipment of the Motor Car



By David Penn Moreton & Darwin S. Hatch.

Editor's Note—Herewith is presented the 142d installment of a weekly series of articles begun in MOTOR AGE, *issue of June 29, 1916, designed to give the repairman and motorist the knowledge which will enable them to care for and repair any and all of the electrical features of the car, no matter what make or model it may be.*

The first half of this series has been published in book form by the U. P. C. Book Co., Inc., 243-249 West Thirty-ninth street, New York, and is sold at $2.50. The remainder of the series will be published as a supplementary volume.

Part CXLII—Simms-Huff Electrical Systems

BY inserting the ignition key in the lighting and ignition switch the ignition circuit is closed. The ignition primary current for starting the engine is supplied by both halves of the storage battery, connected in parallel, and is delivered to the ignition switch from terminal No. 6 on starting switch to No. 6, Bat. +, on the fuse block, the remainder of the primary circuit being as follows:

From terminal No. 6, Bat +, on fuse block to terminal No. 5 on the fuse block, to point A on the back of the lighting switch, from point A to point H on the back of the lighting switch the ignition switch contact spring to point K on the back of the lighting switch and to terminal No. 1, Ign., on the fuse block; from terminal No. 1 on the fuse block, through the circuit No. 1 to the terminal No. 1, on top of the induction coil, through the primary winding of the induction coil to point No. 16 on the coil, to terminal No. 16 on the condenser cover at the timer.

From terminal No. 16 on the condenser cover the current flows through the condenser cover—shown in outline—to the timer breaker points, and from the timer breaker points to point No. 17 on the timer, the contact breaker spring serving as the conductor. Point No. 17 on the timer to point No. 17 at the base of the induction coil and ground completes the circuit. Under running conditions, when the speed of the generator is such that the voltage generated closes the cutout points for charging the storage battery, the ignition primary current is supplied directly from the generator to terminal No. 2, Dyn. +, on the fuse block across the cutout points through the regulator to terminal No. 6, Bat. +, on the fuse block from which point the circuit is the same as under starting conditions.

A condenser is connected directly across the breaker points, and while no steady current flows through it, it is an absolute necessity to get the proper performance of the induction coil.

At the instant the timer breaker points separate a high-tension current is induced in the secondary winding. This high-tension current leaves the induction coil at terminal No. 18.

The high-tension current circuit can be traced from terminal No. 18 on the induction coil to the center terminal No. 18 on the disturber cover, where it is distributed to the separate spark plugs, across the spark plug gap to the ground and thence back to the secondary winding.

Under starting conditions the starting switch plunger is moved forward and completes the circuit between 12 and 13 and between 11 and 10, the same movement meshing the starter pinion with the flywheel teeth. The path of the current will then be as follows: Starting at the storage battery, from terminal 12 to terminal 12 on the starting switch; from 12 to 13 through the starting switch contacts; from 13 on the starting switch to 13 on the storage battery; through the storage battery to 10; from 10 on the storage battery to 10 on the starting switch; from 10 to 11 through the starting switch contacts; from 11 on the starting switch to 11 on the electrical unit, that is, terminal marked +; from + terminal on the electrical unit to brushes 2, 4 and 6; through the armature windings to brushes 1, 3 and 5; through the series windings on the respective pole pieces to the ground.

The windings on the six shunt coils pick up current as follows: Starting at the + terminal on the electrical unit, through circuit No. 2 to Dyn. + terminal on the fuse block; from there through the regulator arm, and across the regulator points, which at this time make a full contact; and back to field terminal No. 3 on the fuse block. From there following circuit No. 3 back to the terminal No. 3 on the electrical unit frame. From this point through the six shunt coils to ground on the pole piece No. 3. The return circuit is from ground No. 15 on the frame to terminal No. 15 on the storage battery.

On releasing the starting pedal the starting switch plunger comes all the way back and makes connection between 13 and 14 and 10 and 6 on the starting switch. In the meantime the terminal voltage of the generator has built up and the shunt winding of the cutout and regulator has become energized through circuit No. 2 from the generator positive to the fuse block, Dyn. +, and through the shunt winding to terminal No. 9, Dyn.—Bat.—. From here the current passes to terminal No. 9 on the regulator shunt contact, which is a grounded connection. In the starting position this ground contact, No. 9, is broken so that the regulator will not become energized at the point of starting. As soon as the voltage reaches a predetermined point, the magnetizing action of the shunt winding will cause the cutout points to close and the panel indicator to show "Charge."

The charging circuit will then be as follows: Starting at the + terminal on the electrical unit, follow circuit No. 2 to Dyn. + on the fuse block, from there through the cutout arm, across the cutout points, through the series winding of the relay to terminal No. 6, Bat. + on the fuse block. From this point follow circuit No. 6 to terminal No. 6 on the starting switch, through the switch contact and No. 10 to No. 10 on the storage battery, through the storage battery to No. 13, to No. 13 on the starting switch, through contact to No. 14, which is grounded. At the same time follow circuit No. 6 through the permanent connection to No. 12 on the starting switch, thence to No. 12 on the storage battery, through the battery and No. 15 to No. 15 on the frame, which is grounded. Grounded connections No. 14 and No. 15 complete the circuit to the motor generator frame.

The Motor Car Repair Shop

Practical Maintenance Hints

Removing Truck Wheels

REMOVING a truck wheel which may weigh as much as ¾ ton, as the case on large trucks, is quite a job to put it mildly. The various methods of accomplishing this should be of particular interest to the dealers and repairmen who have only recently become interested in trucks, and perhaps even the old timer at the game may find something of interest in the processes described.

Probably the simplest means of removing a heavy rear wheel is by the use of a greased plank, Fig. 1. The wheel is jacked up so a smooth plank with a heavy coating of grease may be slipped underneath it. Blocking also is put in place under the axle so that when the wheel is removed there is a substantial support reinforcing the jack in case anything happens to it, and also it stands ready to assume the weight as soon as the jack is removed. This detail of the procedure is not essential but is simply forehandedness.

The retaining nuts holding the wheel are removed, and then the jack is adjusted by slowly moving the handle until only the weight of the wheel rests on the board, the remainder of the weight being carried by the jack. At this moment the wheel is pulled off.

The use of a portable, overhanging crane is shown in Fig. 2. The wheel is blocked up so that it is well clear of the floor and then the chain is attached and the hoist operated until it is just carrying the wheel. Then having removed any retaining nuts, the wheel may be withdrawn.

Fig. 3 shows a sturdily-constructed steel platform mounted on casters. It is used in the same manner as the greased board. It is placed under the wheel and the jack manipulated so that only the weight of the wheel rests on the platform. Then the wheel is taken off. The wedge blocks are simply to prevent the wheel from rolling sidewise.

Fig. 4 shows a more elaborate type used by one of the largest dealers in the country. As in the previous case it consists of a heavy steel platform mounted on casters. One of the wedge blocks is stationary and the other is moved in and out by a crank-operated screw. In operation, the axle first is jacked up so the platform may just be slipped underneath, then the wedge is screwed in until it just lifts the weight of the wheel off of the axle, when the wheel may be pulled off.

Fig. 5 represents the type, totally different, used by another very large dealer. The wheel hangs on a bar which is suspended from an I-beam cross-piece. The up and down adjustment of the wheel is maintained on one side by a sliding sleeve and pin arrangement and on the other by a large jack, its size being to obtain the requisite height, its great lifting capacity being only incidental. With modifications almost any jack would do. The base consists of a U-shaped member bent into the form of a semi-circle and supported by three casters.

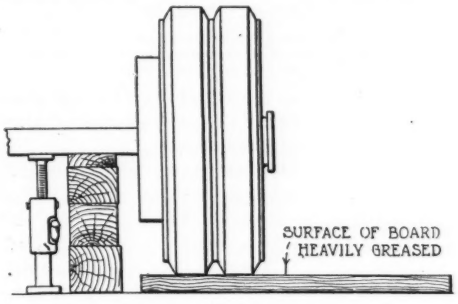


Fig. 1—Removal by greased plank

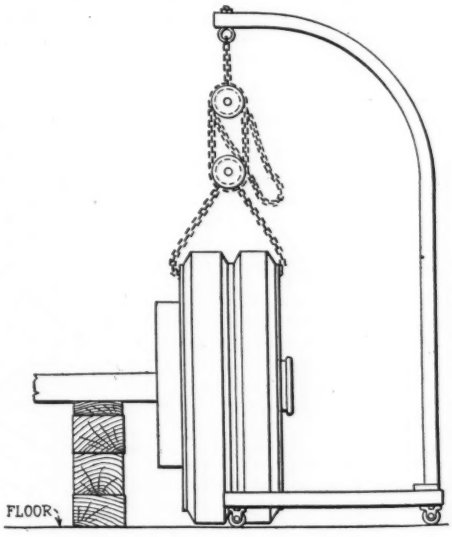
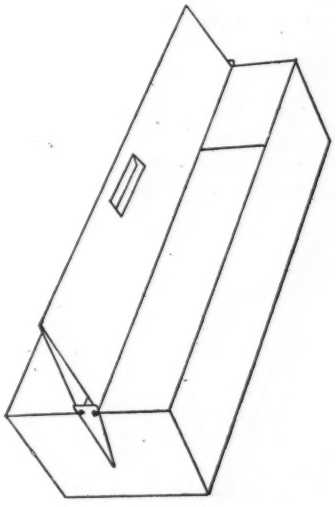


Fig. 2—The portable overhanging crane



Steel Toolbox

A rugged steel toolbox admirably adapted for shop use may be designed so that the cover folds up to form a handle grip by which it can be carried. Each side of the lid is slotted so when the two members are swung up the two slots register to form a handle.

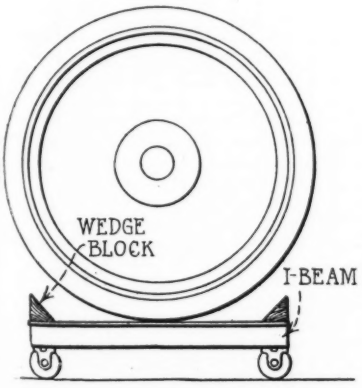


Fig. 3—Steel platform on casters

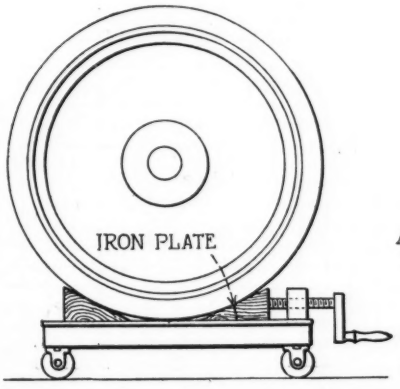


Fig. 4—More elaborate platform

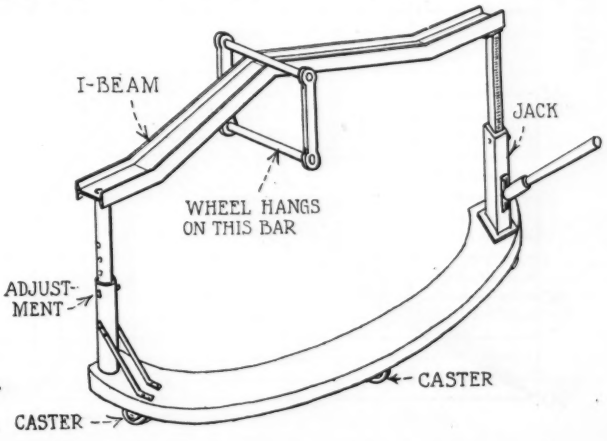


Fig. 5—Type used by a large dealer

The Readers' Clearing House

Questions and Answers

Conducted by B. M. Ikert

Weight and Power Ratios

Q—Publish a chart showing car speeds with different wheel sizes, gear ratios and engine speeds.

2—Do automotive engineers have any standard ratio of engine power to car weight, and of gear ratios and wheel sizes?

3—About what are the ratios generally adopted and how is engine power figured or ascertained for this purpose?—G. R. Robison. Hamilton, Ill.

1—The chart in Fig. 1 gives the car speed when the wheel diameter, gear ratio and the engine speed are known. An illustrative example will show its use. Assume a car with 34-in. tires, gear ratio 4.5 to 1, to find engine r.p.m. when car is traveling 30 m.p.h. On the left side find the 30-mile line and follow this to the right to the gear ratio line of 4.5. Follow this diagonally downward to the 34-in. tire line and then move to the right, giving an engine speed of 2130 r.p.m.

2—Automotive engineers use no accepted standard of ratio between horsepower and car weight. Gear ratios generally are decided upon when the engine characteristics are learned. If an engineer wishes to use a high-speed engine whose fuel economy is best at high speeds, then the average touring and driving speed must be geared to meet this condition. This, of course, will include the wheel size.

3—Generally, 1 hp. has anywhere from 40 to 70 lb. allowed it. Gear ratios vary from about 3 to 5.

Miscellaneous

Testing Gasoline

Q—Give practical test for gasoline.

2—Give names of companies handling testers. —Vickery Bros., Barnwell, S. C.

1—There is no practical way to test gasoline, unless it be by the process of evaporation. The gravity test used to be in vogue, but it is not accurate now, owing to the manner in which gasoline is made. The gravity test is accomplished by the use of a hydrometer, which would have a scale of from 60 to 80. Gasoline used to be rated above 65, but is probably considerably under 60 now. The maximum and minimum boiling points would be the only real test, but this is not easily accomplished. A fair way is to pour a little in the hand. If it evaporates quickly and does not leave any considerable amount of oil on the hand, it may be taken as a good grade, but if there appears to be a considerable amount of kerosene left in the hand, and it requires some time for evaporation, then it is certain it contains a goodly amount of the heavier oil, or kerosene, which does not readily volatize.

2—American Thermo Ware Co., 16 Warren street, New York; General Scientific Equipment Co., 2720 West Lehigh avenue, Philadelphia, Pa.; Taylor Instrument Co., 95 Ames street, Rochester, N. Y., all these concerns make hydrometers and other testing instruments.

Making Service Truck

Q—I desire to convert my model 21 McLaughlin-Buick into a truck. Can you advise me how best to do this? I want to use same as service car and truck to do my own freight hauling from the cars, such as farm implements and repairs, accessories, tires, oil barrels, etc. The body is a five-passenger and I want to leave the front seat on; top, rear, seat, etc., go on the junk pile. Will the frame and springs stand to make a 1500-lb. truck out of same, or would it be advisable to reinforce frame? The car has 34 by 4

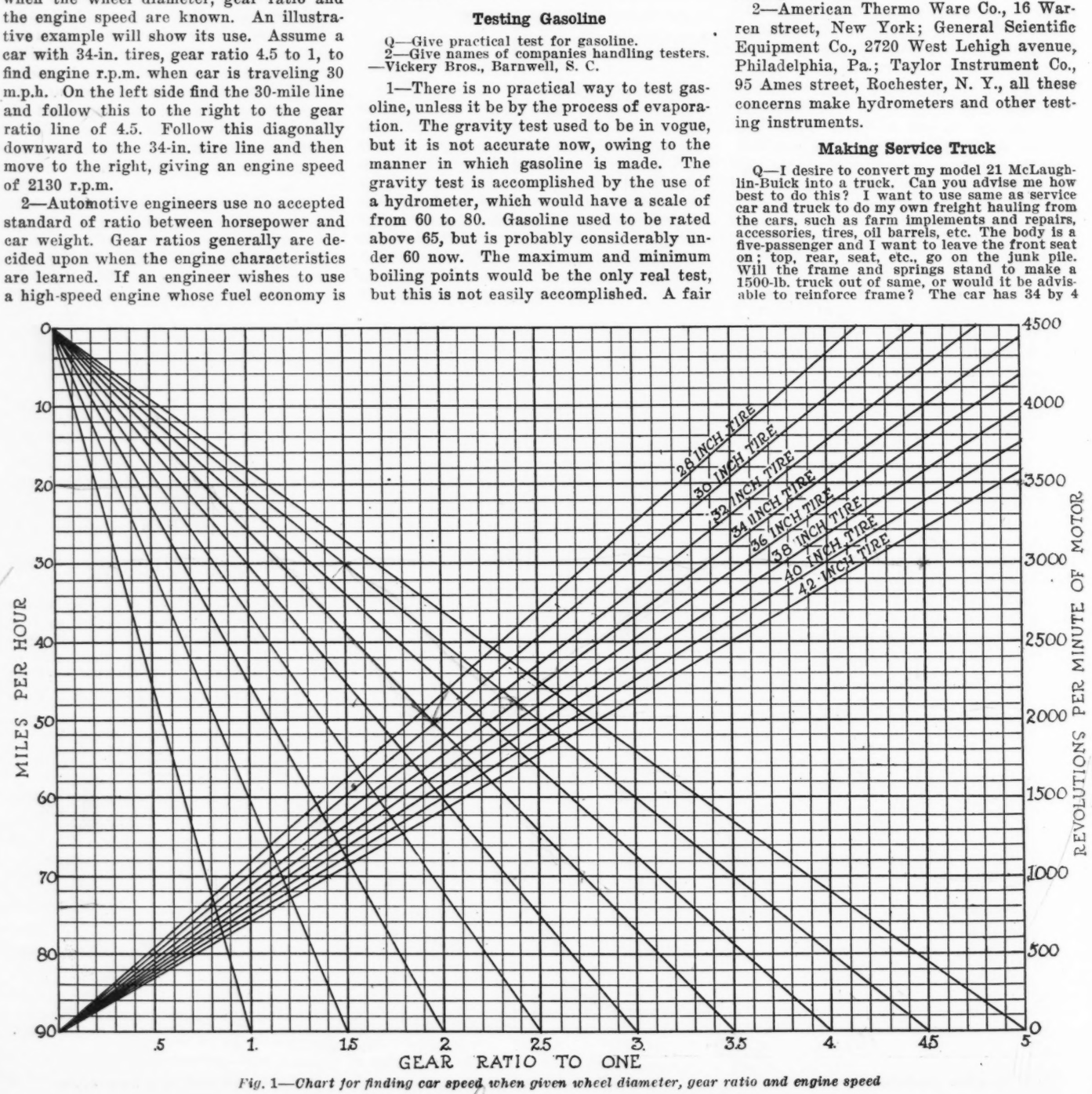


Fig. 1—Chart for finding car speed when given wheel diameter, gear ratio and engine speed

casings, 30- to 35-hp. engine, rear springs full elliptic.—J. P. Hardy, Alton, Manitoba.

A five-passenger car with five people in the back seat is loaded down pretty well. Five average adults would not weigh more than 750 lb., only half as much as you contemplate carrying. It would be like putting ten or twelve in the back seat. We believe you would be wise in re-enforcing your springs and frame and while doing this you might as well make the frame a little longer. In Fig. 2 is a suggestion for doing this, with two suggestions for the springs. The extra frame is either of wood or steel and fastened securely to the old frame directly above the old springs, it being wider than the old frame. The rear attachment would probably be the old spring bracket.

One spring suggestion is to remove the old springs and put a regular semi-elliptical truck spring, as at A; the other is to leave the old springs on and put on an auxiliary cross spring, as shown at B. The ends of this spring are free and rest on plates held in place by the old shackles. Normally they are an inch or so above the plate which should give easy riding qualities when there is no load. The rear spring should be at least equal in strength to the combined strength of the other two.

Steering Gear on Regal

Q—How do you adjust the steering gear on a model T 1912 Regal?

2—Is there any way to adjust clutch to keep it from slipping?—Ethan Sabin, Watkins, Iowa.

1—If all the wear has not been taken up, loosen the clamping bolt that holds the two parts of the casing together and then adjust by turning the large nut above—to the right to tighten and to the left to loosen. If this does not take care of the play, it may be necessary to put in a new worm and also a new gear.

2—This is a cone clutch, leather faced, and there is no adjustment for it. If the clutch slips, it probably needs to be cleaned thoroughly. This can be done by wedging the clutch lever back to hold the clutch out. Then use a thin brush to work between the flywheel and the leather on the clutch, applying kerosene and letting it stand for a while to loosen the oil and raise the fiber of the leather. Clean off with gasoline and when it has dried apply neatsfoot oil, permitting this to remain over-night to soak in. Be sure the neatsfoot is spread thoroughly over all parts of the leather. If this does not prove a remedy, it may mean a new leather, and this is not at all unlikely, or perhaps a new clutch spring, for it is possible the old one has become weakened.

Adjustment of Rayfield

Q—Explain how to adjust Rayfield carbureter on 1915 Saxon six.—Tire Sales Co., Albuquerque, N. M.

To adjust low speed with throttle closed and dash control down, close nozzle needle by turning low-speed adjustments to the left. Then turn to the right about three complete turns. Open throttle not more than a quarter. Prime carbureter by pulling steadily a few seconds on priming lever. Start engine and allow it to run until warmed up. Then with retard spark, close throttle until engine runs slowly without stopping. Now, with the engine thoroughly warm, make final low-speed adjustment by turning low-speed screw to left until the engine slows down and then turn to the right a notch at a time until the engine idles smoothly.

If the engine does not throttle low enough, turn the stop arm screw to the left until it runs at the lowest number of revolutions desired. To adjust high-speed advance spark about a quarter turn open the throttle rather quickly.

Should the engine backfire, it indicates a lean mixture. Correct this by turning the high-speed adjusting screw to the right about a notch at a time, until the throttle can be opened quickly without backfiring. If loading, choking, is experienced when running under heavy load with throttle wide open, it indicates too rich a mixture. This can be overcome by turning high-speed adjustment to the left. Adjustments made for high speed will in no way affect low speed. Low-speed adjustment must not be used to get a correct mixture at high speed. The adjustments cannot change.

TO assist readers in obtaining as a unit all information contained in this department on a certain subject MOTOR AGE segregates inquiries into divisions of allied nature. Questions pertaining to engines are answered under that head, and so on.

MISCELLANEOUS

G. R. Robison.....Hamilton, Ill.
J. P. Hardy.....Alton, Manitoba
Vickery Brothers.....Barnwell, S. C.
Ethan Sabin.....Watkins, Iowa
Tire Sales Co.....Albuquerque, N. M.
L. Ammeing.....Rochester, N. Y.
Dale L. Fritcher.....Nashua, Iowa
Louis J. Boivin.....L'Anse, Mich.
John Rawley.....Astoria, Ill.
C. E. Norris.....Peru, Ind.
W. R. Beck.....Amarillo, Tex.
C. O. Wellmon.....Binghamton, N. Y.
H. M. Scott.....Helena, Ark.
T. J. Babb.....Port Lavaca, Tex.
Hubert E. Potts.....Portsmouth, Ohio
Harry C. Johns.....Ogden, Utah
Homer Poe.....Minier, Ill.
C. T. Reeser.....Lorington, Ill.
C. W. Campbell.....Greenville, Pa.
John S. Reed.....Chicago
John Livingston.....Listowel, Canada
W. A. Blank.....Jacksonville, Fla.
W. C. Chandler.....Indianapolis, Ind.
Philip Herwig.....Baltimore, Md.
Burton Billings.....Madison, Wis.
Robert Britt.....Richfield, Idaho
C. G. Sterks.....Akron, Ohio

THE ELECTRIC SYSTEM

Michael Seitz.....Cleveland, Ohio
A. J. Hoefert.....Juanita, N. D.
Joseph Maguire.....Dillon, Mont.
Harry C. Johns.....Ogden, Utah
R. J. Strauch.....Verdon, S. D.
C. R. McGinnis.....Wichita Falls, Tex.
C. T. Reeser.....Lorington, Ill.
S. T. Fry.....Oak Hill, Ohio
J. W. Kelly.....Columbia, S. C.

ENGINES

C. T. Reeser.....Lorington, Ill.
Charles Hetherington.....Bentleyville, Pa.
N. H. Van Stavern.....Sinks Grove, W. Va.
C. C. Denny.....Seattle, Wash.
Ray Barlow.....Sharpsville, Ind.
F. W. Dance.....Lisbon, Iowa
Reader.....Columbus, Ohio
Lee LaBrue.....Byron, Okla.
James Krokosch.....Canton, Ohio
Reader.....Albin, Miss.
G. A. Henry.....Andover, Ohio

REBUILDING

Robert H. Olsen.....Omaha, Neb.
B. Wellington.....Casper, Wyo.

No communication without the writer's name and address will be answered in these columns.

Packard Repair Questions

Q—What is the size of a tire for a 1914 Packard limousine?

2—What is considered the average time of a garage mechanic to take up the main bearings on an engine?

3—Does this type of car have to have wheel puller to take the wheels off the axles?—L. Ammeing, Rochester, N. Y.

1—Front, 36 by 4½; rear, 37 by 5.

2—A good mechanic can do this job in 35 to 40 hr.

3—Yes.

Starter on Ford

Q—What pressure is it possible to produce in a B or large size Prest-O-Lite tank by piping to it from two cylinders with ¼-in. copper tubing, the idea being to apply the pressure to the cylinders through a distributing valve for starting? What would be the minimum pressure required? These questions apply to a Ford.

2—In a system like the Ten Eyck, if the pistons happened to stop with one pair not quite to top center and the other pair nearly to bottom center, would not the starter be inoperative? This would be impossible on a six-cylinder car but not on a four. I believe the old Winton six used a starter of this type.—Dale L. Fritcher, Nashua, Iowa.

1—The Prest-O-Lite tank will be large enough, so far as pressure is concerned, but it is doubtful if it will contain sufficient volume to be of service. The pressure necessary to operate the starting motor would depend upon the nature of the latter, and the volume necessary would depend upon the adaptability of the engine to respond to the starter. When warm the engine perhaps would start readily and the tank would have sufficient volume to accomplish the work, but on the other hand if it happened to be cold or the engine a little unreasonable, then the contents of

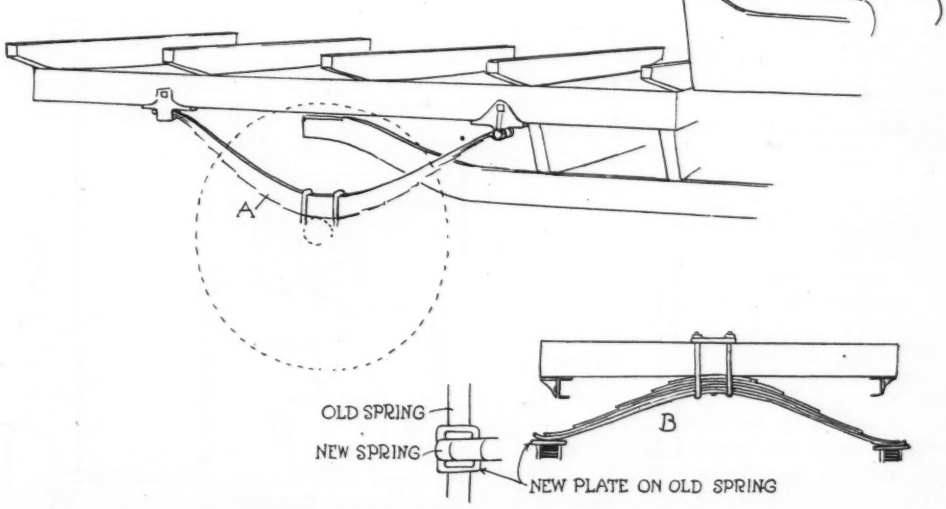


Fig. 2—Method of strengthening rear of car used as truck

the tank would be exhausted before the engine had responded, resulting in the use of the Armstrong starter that came with the car.

2—Yes, you are correct in your assumption. But here arises a question. Do four-cylinder cars ordinarily stop in this manner? If so, one of the upper cylinders is about to explode, meaning that that cylinder already has compressed the gas. If the inertia did not carry it over the dead center, the compression would carry the engine back a part of the stroke so that the piston would not be in an inoperative position.

Wants Air Compressor

Q—How can an air compresor be made out of an Overland 69 engine?
2—Will the engine compress air to 200 lb. pressure?
3—How long will it take at about 350 r.p.m.?
4—How can an air compressor be made out of a one-cylinder Lake Shore marine engine?—Louis J. Boivin, L'Anse, Mich.

It is very evident you do not realize the immensity of the task. If the Overland 69 engine had a detachable head, the job might be simplified, but as it is now it is next to prohibitive. We advise you to buy a compressor and save about a third of the machine work cost. For a gas engine to compress air up to 200 lb., the clearance volume of the engine must be reduced to about 6 per cent of the piston displacement. This entails much machine work, many new parts and is useless when air compressors can be bought for $15 and up.

Timing Gears on Maxwell

Q—The intake and exhaust timing gears on the camshaft of a 1911 Maxwell are broken. Give instructions to install new gears and time them correctly.—John Rawley, Astoria, Ill.

There should be little trouble in installing new timing gears if you will take the precaution to see that the old gears are marked, or to mark them if they are not. Perhaps you will wonder why the old gears are to be marked; it is for comparison in case the new gears from the factory do not happen to have marks on them. It is probable the new gears will be marked, but this sometimes is omitted. Be sure, when ordering, to have the factory mark exhaust and intake, so you will not make a mistake and have to pull down the engine again. If the old gears are not marked, mark them with a different mark for the exhaust and the inlet. You then can remove the gears from the camshafts and by laying the new gears on the old ones, lining up the keyways, mark the new gears to correspond with the old markings.

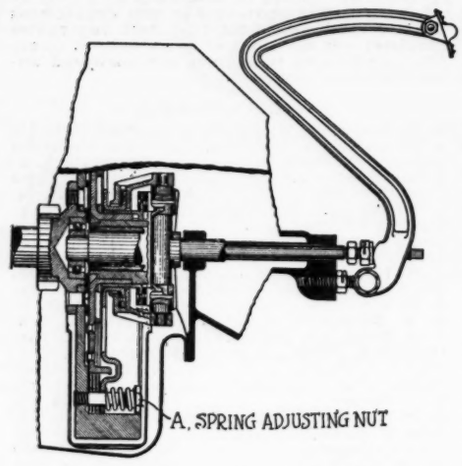


Fig. 4—Clutch on Hupmobile, showing adjustment

Let us suggest, however, that if you are putting in new camshaft gears you should include a new gear for the crankshaft, otherwise the new gears will not mesh well with the old gear on the crankshaft. In this case it will be necessary to see that marks for both exhaust and inlet camshaft gears are on the crankshaft gear.

It will be necessary to remove the cover of the transmission and also the clutch case, which will expose the timing gear-case. Take off the side cover plates on the crankcase, remove the pins in the cams and force the camshafts forward about 1 or 1½ in. Then place the new gears in proper position in relation to the marks and force back the camshafts to their original positions and replace the pins. It will be necessary to remove the face plate as well.

In case you put in a new gear on the crankshaft it will be necessary to take out the crankshaft to slip the gear over the end of the shaft. This is not an easy job and probably will require some sort of a puller to start the gear. The flywheel has a mark DC, meaning dead center, and it might be just as well to have this in an upright position when marking the old gears. It would not be a bad plan to mark the flywheel at the various valve openings when you are looking at the old markings or after you have installed the new ones. You can tell by turning the engine over—before everything has been put back into place—if the valves are opening at about the right time. If not, it will be necessary to unmesh and turn the gears over a tooth at a time.

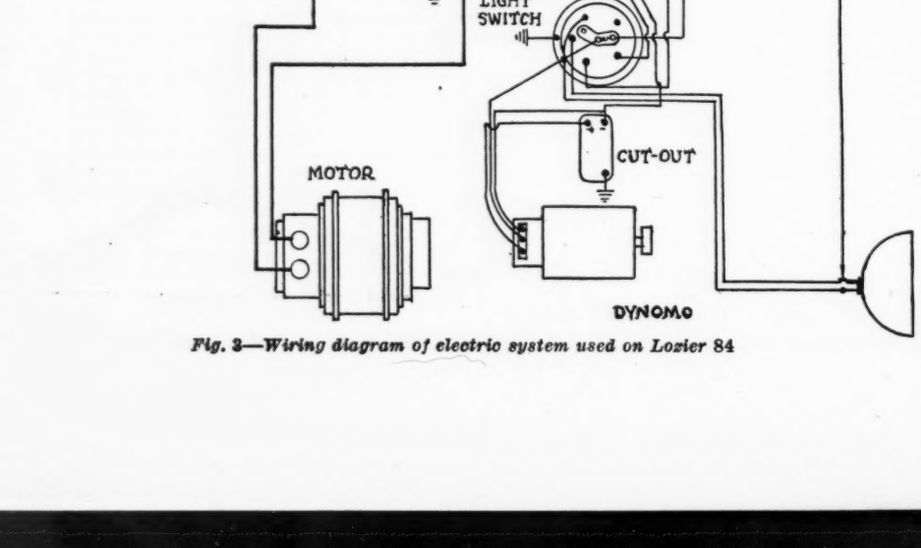


Fig. 3—Wiring diagram of electric system used on Lozier 84

1914 Hupmobile Clutch

Q—What clutch has the model H Hupmobile? Give instructions to dismantle same?—C. E. Norris, Peru, Ind.

The Hupmobile has a multiple-disk clutch shown in Fig. 4, which runs in an oil bath. To dismantle it is necessary to remove the engine from the frame. This will expose the clutch throwout collar by which the crankshaft and flywheel are removed as a unit. The clutch now can be dissembled by removing the clutch springs around the inner rim of the flywheel.

Wheel Traction in Circling

Q—When a car is traveling in a circle, which wheel is the tractor? Is any power being applied to the outside wheel?—W. R. Beck, Amarillo, Tex.

The one on the outside. Yes, in proportion to the radius of the turn. The wheel on the outside, naturally, is traveling farther than its mate on the inside and inasmuch as the inside wheel is doing practically no work and it devolves upon the outside one, it stands to reason the power much be applied to that wheel. Supposing a rear axle alone could be operated by power. The inside wheel could be placed on a spot and the power would drive the outside wheel around the circle. The inside wheel would require no power, and the differential gear would be working to take care of the difference in the travel of the two wheels. Belt-driven cyclecars, for instance, did not have to have differential gears because in turning a corner the inside belt would be slack and the outside would be transmitting the power.

Entz Transmission

Q—Why is it the Entz electric transmission is not placed in car of moderate price, say in the $1,500 class?
2—Do you know of any effort being made to place such a car before the public?
3—Is it possible for an individual to buy one of these transmissions?
4—If so, can it be bought in unit with a suitable engine?
5—A Detroit engineer told the writer about three years ago that practically every manufacturer in Detroit was experimenting with some form of electric transmission. What were the conclusions of the different firms regarding this form of transmission?
6—Explain the theory of a true high-tension magneto.—C. O. Wellman, Binghamton, N. Y.

1—The cost of manufacture of the Entz transmission is one of the chief reasons for not using it in the cars of the $1,500 class.

2—No.

3—The Owen-Magnetic has the exclusive right to the use of the Entz transmission, so with that consideration it is not probable that you can buy one without getting the car.

4—See 3.

5—The result of the investigation is illustrated by the cars of to-day. It was decided that for the electric transmission to be reliable it must be well made and from materials and parts whose cost would

be prohibitive in the moderate priced car, but for the higher priced car it would do.

6—Essentially all high-tension magnetos are the same, in that they have a two-pole armature, wound with a primary winding and a secondary winding. Then they have the permanent field magnets which retain sufficient magnetism after being charged to deliver the necessary field flux for current generation. In the case of the four-cylinder engine the armature revolves at crankshaft speed and at one and one-half times crankshaft speed in the case of the six.

The current is collected from rings on the armature, the high-tension current going to the distributer and the low-tension current to the contact breaker. The contact breaker normally holds the primary in a short-circuited condition, except at the point where the spark is to occur, when the breaker opens the circuit. The breaker is so timed with the position of the armature and the spark in the cylinder, that the opening of the circuit occurs at the time when the armature poles are cutting the lines of force of the field at the maximum rate. This allows the current in the primary to build up immediately, as no voltage can be maintained on a dead short-circuit. This rapid building up of voltage in the primary causes an induced voltage to be generated in the secondary. Since the distributer is synchronized with the breaker, the path to one of the spark plugs is made and the high-tension current completes its circuit by jumping the gap.

Ether with Gasoline

Q—How much ether should be used in 1 gal. of gasoline in a Velie six? What effect will it have on the engine? Will it be dangerous to use it?—H. M. Scott, Helena, Ark.

If the ether is used to render starting easier, then it is wiser to inject into the intake manifold from a little tank under the bonnet a small quantity of an equal mixture of gasoline and ether. This method has been used with much success and is better than mixing ether with the whole quantity of the gasoline. However, if you do not want to make this change, ether can be mixed with the gasoline in the proportions of 1 oz. to 1 gal. It is claimed by some who have used it for years that no ill effects are observed. Ether should not be exposed to open flame. Outside of this, there is little or no danger.

Biddle Speedster Horsepower

Q—What is the brake test horsepower of the Biddle speedster?
2—Publish a side view of this car?
3—Give the address of a company that will make a special radiator for a Ford racer.
4—Does MOTOR AGE think the sixteen-valve cylinder heads would help the speed and power of a Ford?
5—Can the Ford stroke be lengthened, and is this advisable for racing?
6—Publish side view of the Ford racer used by Joseph C. Haynes of San Francisco.—T. J. Babb, Port Lavaca, Tex.

1—The brake test of the Biddle speedster engine is 48 hp.

2—The speedster is shown in Fig. 5.

3—Detroit Radiator & Specialty Co., Detroit; National Can Co., Chicago.

4—The sixteen-valve head unquestionably will increase the power, and to utilize it is better to decrease the gear ratio. Then the speed will be increased proportionately.

5—The Ford stroke can be lengthened by using a crankshaft of longer throws and then having a new engine block made to accommodate the increased stroke. When this is done there will be no Ford engine left, so it might be better to use a whole new engine. A Ford engine so reconstructed would certainly not be considered as a standard Ford engine.

6—We have no record of this car.

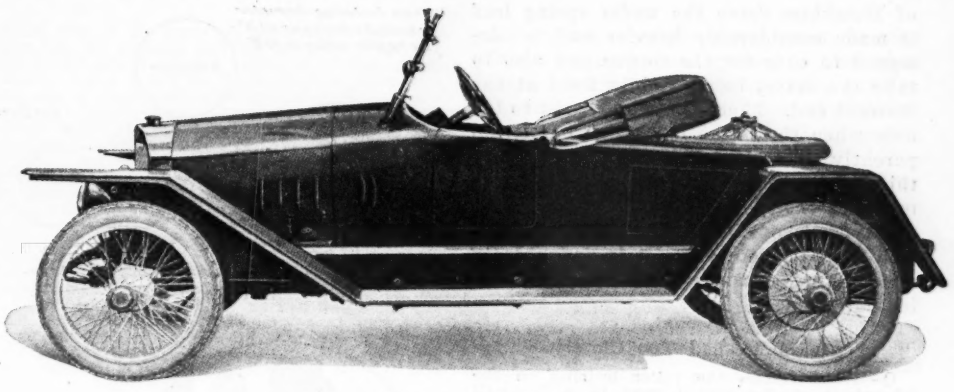


Fig. 5—Side view of Biddle speedster

1912 Mercer Specifications

Q—What is the bore and stroke of the Mercer 35R?
2—Was this car considered a fast car?
3—What ignition system did this car have?
4—Would it make a good speedster?
5—How is it geared in high gear?
6—Is the rear axle full floating?
7—Could this car be fitted with a modern carbureter, or is the stock carbureter all O. K. on this model?—Hubert E. Potts, Portsmouth, Ohio.

1—4⅜ in. by 5 in.

2—At that time, 1912, yes.

3—Bosch dual.

4—Yes.

5—2½ to 1.

6—Yes.

7—It is better to fit a modern carbureter and redesign the intake manifold so it will be shorter and offer less chance for condensation.

Changing Wheel Sizes

Q—I have a 1915 seven-passenger Hudson which has 36 by 4½ tires. Can I put a set of 32 by 4½ wire wheels on? The front and rear rims are 36 by 4½.
2—Give me the names of manufacturers of speedster bodies.
3—Do you advise making the change in the body?—Harry C. Johns, Ogden, Utah.

1—This is not advised, as the gear ratio and road clearance are changed and the engine has to travel much faster.

2—Charles Schutte Body Co., Lancaster, Pa., Lehman Mfg. Co., Cannelton, Ind.; Millspaugh & Irish, Indianapolis, Ind.

3—The change in the body is a matter of taste and does not involve any mechanical changes detrimental to the engine.

Driving Car by Propeller

Q—I intend to remove all weight possible and run a car with a two-blade propeller mounted on center of frame in back and driven direct from engine by a driveshaft. The engine will make 1500 r.p.m. on high gear with the present equipment of regular transmission and ring and pinion gears. The weight of the car stripped is about 700 lb. Can I drive in the mud or up hills, and how fast can I travel on good roads with the propeller drive? What size propeller should I get? What bevel or pitch should the blades have?
2—Would I have plenty of power for all kinds of driving, and would it be equal to the present system? I expect to take all gears out to reduce any friction.—Homer Poe, Minier, Ill.

1—A recent experiment by Packard was along these lines, except a 3-ton truck was used, driven by a Liberty engine of twelve cylinders and with a rated capacity of 450 hp. But it would be difficult to advise you when you have not told the make and size of the engine you are to use and the weight and gear ratio of the car when your engine turned 1500 r.p.m. If you will go more into details, perhaps we will be able to assist you in solving your problem.

2—This is an open question and one that can be better answered after experiments have been conducted. Perhaps Packard will be willing to give you some additional details about the experiments made with the Liberty engine in the truck chassis.

Using Graphite in Oil

1—Can graphite mixed with the cylinder oil be used in all engines? What proportion of graphite to the gallon of oil? I understand it cannot be used in a Ford on account of the magneto collecting the graphite and short circuiting.
2—Of what composition is graphite?
3—Should a mechanic have a chauffeur's license to test or try out a car, with the owner's consent, in Illinois?—C. T. Reeser, Lorington, Ill.

1—No. Graphite should never be mixed in with the oil in a Ford. The proportion of oil to graphite is 95 to 5.

2—Graphite is a form of carbon. Carbon exists in the graphite form, the amorphous form and the crystalline form. The graphitic form is used for lubricating purposes, and the deflocculated form of this kind of graphite is considered best.

3—The state laws of Illinois say that a mechanic must have a license to operate car, even for testing. Illinois state law for motor vehicles, section 13.

Use of Hotchkiss Drive

Q—What is the opinion of the majority of expert car engineers as to the success of the Hotchkiss drive? What percentage of cars use it?
2—When the strain of driving power is absorbed by the rear spring, it seems natural that upon straightening out the spring under load, it would force the rear axle back, thereby lengthening the driveshaft. What effect has the application of brakes toward turning rear axle housing with the same result. I am curious to know why one method is better than another. For myself I favor torque and radius rods.—C. W. Campbell, Greenville, Pa.

1—Since more than 60 per cent of the makes of cars of 1918 utilized the springs to take the drive, in other words displacing torque tubes and torque arms, this would seem to form a safe majority in favor of this type of drive and would also seem to indicate the fact that a majority of the engineers favor the practice.

2—This is true to a limited extent, but it is cared for by the use of splines on the driveshaft end, which are permitted to work in a female member on another part of the shaft, thus providing for the elongation due to the action named. In the use

of Hotchkiss drive the under spring leaf is made considerably heavier and is designed to care for the torque and also to take the drive, being rigidly fixed at the forward end. There is a slight twist to the axle when the brake is applied but it apparently does no harm. There are some things in favor of a torque or torque arm, but with the Hotchkiss drive greater simplicity and consequently cheaper construction are obtained, while it is undoubtedly a fact that considerable weight is eliminated.

Gears Meshed Too Closely

Q—What causes the roller bearing on the driveshaft at the pinion gear in a Maxwell 25, 1914 model, to go to pieces? I have put in four in the last six months. The outer sleeve is in good condition. The inner sleeve is new in each case. Ring gear and pinion gear seem in good condition. A thing steel washer separates the pinion and roller bearings. Ahead of the bearing is a ball race for thrust. The broken bearings look as though the pinion gear and washer was wearing into the roller bearing. I am told Hyatt bearings should have no end thrust.—John S. Reed, Chicago.

In all probability the ring gear is set up too close to the pinion and this forces the latter slightly out of line. It may be true that the pinion shaft is not in alignment. After you have put in a new bearing see that the pinion shaft is lined up carefully. Then see that the pinion gear meshes with the ring gear nicely and that it is not binding. The faces of the gears should come even and there should be just enough play between the two gears so that, when thoroughly locked, a cigaret paper may pass between the teeth when turned by hand and the paper not be destroyed. The thrust bearing has nothing to do with the pinion shaft bearing—or should not. The thrust bearing easily should take care of the thrust. A Hyatt bearing is not designed to care for thrust in any manner; it is to carry an annular load only.

Plugs on 1915 Cole

Q—The engine on a 1915 Cole eight model 850G was overhauled thoroughly last August, all worn rings replaced with patented rings and complete new set of points in timer. The spark plugs fill up every two or three days with oil and carbon, and a little oil oozes out around the barrel of Nos. 1, 4 and 8 plugs.

2—Would it pay to scrap the old H2 Stromberg carbureter and install a 1919 H2 Stromberg?

3—Publish the name and make of plug best suited for 1915 Cole eight. I had a lot of spark trouble last season. I have used Champion AC Titan up to last fall, when I changed to their heavy-duty plugs.—John Livingston, Listowel, Ontario, Canada.

1—The position of the plugs in the 1915 engines used in the Cole was directly over the heads of the pistons, and because of troubles similar to those complained of the factory changed the position, placing the plugs over the valves. Probably the trouble can be overcome by tapping in over the vales and using ½-in. size plugs. The old plugs may be left in place, with wires disconnected, of course, or the openings may be sealed with parts provided by the manufacturer for the purpose. It would seem, however, that your rings are permitting too much oil to pass, and this may be due to the fact that the cylinders are not true and the new rings cannot find a proper seat. It seldom does much good merely to fit new rings unless it is ascertained that the cylinders are at least practically true. You also are losing some compression through the plugs, which are not tight, or else oil would not find its way around the barrels.

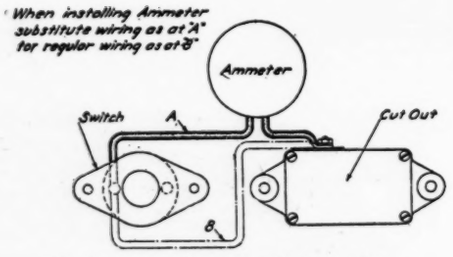


Fig. 6—Ammeter connections in Genemotor circuit

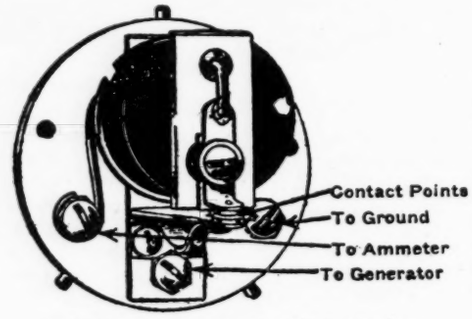


Fig. 7—Circuit breaker on Chevrolet 1915 model

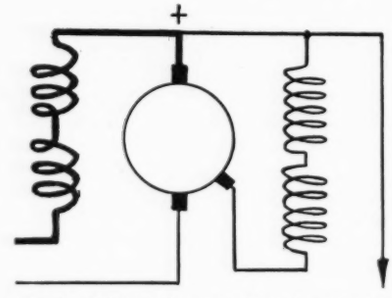


Fig. 8—Wiring diagram that shows principle of Genemotor

There should not be so much oil in the cylinders, and this can be remedied only by having the rings fit the cylinders.

2—There should be no reason for displacing this model of the Stromberg carbureter.

3—Changing plugs will not bring a remedy, as you can see by the answers above. MOTOR AGE cannot make recommendations in this line but will state that the AC is being used on the newer models of the Cole.

Oversized Tires on Buick

Q—I intend to purchase a Buick six, model H, in April, and I expect to put oversized tires, 34 by 4½, on. This will cause my speedometer to register wrong. How can I adjust this?

2—Will oversized tires make the car harder pulling at high rate of speed?

3—Will it roll just as easy with oversized tires?

4—Does the tire wear so much longer so as to make the difference in price?—W. A. Blank, Jacksonville, Fla.

1—It will depend on what model H you buy. The H44, H45, H46 and H47 carry 33 by 4-in. tires as stock equipment, while the H49 and H50 have 34 by 4½-in. It is presumed you are to change from a 33 by 4-in. to the 34 by 4½-in. In this case you will have to have a 68-tooth sprocket on the wheel, leaving the original on the shaft. The correct size of sprocket on the wheel always is represented in the number of teeth by twice the diameter of the tire, measured in inches.

2—The oversize will have a tendency to raise the gear ratio slightly, and while it would not be as effective in hillclimbing and in heavy going it would permit a little faster speed on a good road at the same engine speed. It, of course, will take a little more power to get the car rolling, and there will be a slight increase in the wind resistance and in the unsprung weight.

3—Yes, and they will give more comfort on a rough road or on such a pavement as granite blocks.

4—Yes, without doubt, for it must be remembered the larger size tires have greater resisting qualities, being heavier and thicker and with more than rubber.

American Scout, Made 1912

Q—I recently bought an old American underslung two-passenger Scout. What year was it built?

2—What was the selling price?

3—Where will I be able to get parts?

4—Could you suggest color scheme for a hot paint job and any changes that would be of advantage to the car?

5—Where can I purchase tires for same, and the correct size?

6—Any other information that you may have. I bought this job with an idea of resale but am so pleased with this car's performance that I have decided to keep same for my personal use.—William C. Chandler, Indianapolis, Ind.

1—The American Scout was built in 1912.

2—The sale price was $1,250.

3—Parts may be obtained from: V. A. Longaker, Indianapolis, Ind.; J. C. Gorey, New York; Charles E. Reiss, 1690 Broadway, New York.

4—The color problem generally should be solved by the owner. If you want an effect that is extraordinary, why not try white with dark blue running gear and fenders, or green with black running gear. One or two similar jobs noticed by the writer presented a very pleasing appearance.

5—Any of the big tire manufacturers can supply you with these tires.

6—It will do well to shorten up the lead in pipe to the manifold from the carbureter, and install a new carbureter that is better able to handle the low-grade fuel now on the market.

His Car Has No Power

Q—Why has my Cadillac eight, 1915, no power? I have put in new piston rings, new timing chains, have taken up all bearings and have ground-in valves.

2—I also have a 1914 Cadillac and have put in new piston rings, new timing chains and have taken up all bearings and ground-in valves, but it always knocks when it is pulling a grade or running on level ground and loses power while pulling a grade.—Philip Herwig, Baltimore, Md.

1—It is impossible to state from the information you give the exact reason for lack of power in your car. It may be that either the spark or valve timing is wrong or there is improper compression or a restriction in the carbureter or gasoline feed. Possibly the ignition does not give a sufficiently hot spark.

2—The fact that the engine knocks when pulling a grade and looses power may mean that your spark is advanced too far. A competent mechanic should be able to test this sufficiently to determine the trouble.

Required Tools for Repair

Q—What tools will I need for general care and maintenance of a Buick, including engine work? It would necessarily be a general set of tools, because I may change to some other car.—Burton Billings, Madison, Wis.

A set of double open-end wrenches that will fit every nut and bolt on the car is very essential. If pliers and monkey wrenches are used continually on the nuts and bolts of the car, they soon will become

mutilated. Three screwdrivers, one for fine work, such as breaker point adjustment; one for medium size work, equipped with a wooden handle so it can be used for spark plug testing; and one heavy-duty screwdriver that will serve a general-utility purpose, such as an emergency chisel or crowbar. It is generally found that a screwdriver of the last type is a valuable addition to the toolkit. A ball pien hammer, two pairs of pliers, one for heavy work, a spark plug wrench, tire tools and a serviceable jack are about all that are required for the ordinary toolkit. For the toolkit in the garage, it is necessary to have a vise, Stillson wrench, valve spring lifter, valve grinder, a good grease gun and, if possible, a breast drill. These tools should suffice for almost all ordinary repair work.

Case Tractor Lubrication

1—We have a 9-18 Case tractor that uses about 5 qt. of oil in 10 hr. running, plowing in stubble about 7 in. deep. Is this too much oil?
2—Does it harm the tractor to run the right side wheels in the furrow?—Robert Britt, Richfield, Idaho.

1—Oil consumption depends on the condition of the machinery. If the engine is out of adjustment and the piston rings not tight or fouled with carbon from a poor grade of oil, the oil consumption will be heavy. Under ideal conditions your tractor should have the oil in the crankcase changed for every 75 to 100 gal. of kerosene consumed or, if gasoline is burned, every 200 gal.

2—There are no records of injury done to the Case tractor from running it in the furrow, but the practice is not recommended.

Oiling Cone Clutch

Q—The Oldsmobile model 37 six-cylinder is equipped with a cone clutch. How is the clutch spindle lubricated?
2—What should my ammeter read at 20 m.p.h.?—C. G. Sterns, Akron, Ohio.

1—The clutch spindle on this car is supposed to be lubricated through a small hole through the transmission shaft and by the oil in the gearcase, but unfortunately this does not supply a sufficient quantity. About the only way this part can be lubricated is to take up the floorboard and put grease or oil on the clutch, release rod and permit it to find its way to the spot.

2—On this model of Oldsmobile between 15 and 17 amp.

Steering Wheel on Cole

Q—Explain how to adjust steering wheel on a 1915 Cole. The wheel has too much play.—John Livingston, Ontario, Canada.

There is only one adjustment for the steering gear, and this is to be found immediately above the worm gear housing. Turning to the right will tighten and to the left will loosen, but the clamping nut will have to be loosened before this can be accomplished. If the gears are badly worn, they can be reversed and the bushings can be replaced.

The Electric System

Chevrolet Battery Trouble

Q—Late in the fall of 1917 the battery in a 1915 Chevrolet 490 touring car was weak, so I put it down in the cellar. The next spring when the car was to be used I thought it advisable to put the battery back in the car, so I used four dry cells connected to storage battery terminals, started the car, turned on the lights and everything was O. K. We went about 1½ miles, visited until dark and started home and everything was O. K. until we went about 40 rods, then the car stopped and the lights went out. I could not get it started again, so I was towed home. Later I put in the storage battery and the car worked good with the exception of the lights. They were dim and now and then would brighten up for a short time only and then get dim again. The car got harder to start all the time so I procured a new battery. The car started good at first with the lights the same as before, but later the car started hard and still later it would not start at all, so we used four dry cells with a make and break spark coil and would hold the wires on the storage battery terminals and then the car would start easy at first and finally it would not start with the two batteries only when it took a notion to. Later the lights and horn worked fine when the car was first stopped, but the next day both lights and horn were dead, but as soon as the car was started the lights and horn worked fine. The battery retained its voltage if the car was used occasionally.
2—I have another Chevrolet of the same age but a Baby Grand, which was pulled in late last fall. The batteries were dead and the frame that holds the starting crank was broken so we had the battery recharged and replaced. It worked fine, but the car did not start and then it got cold, so I did not pay any attention to the car for some time and then found the battery frozen. Where could the trouble be?—A. J. Hoefert, Juanita, N. D.

1—Dry batteries should not be used in place of a storage battery, as they have insufficient capacity. Then again, the generator forcing current into a dry battery will reduce the voltage of the dry battery. It must be remembered there is no relation between a dry battery and a storage. One represents a reversible chemical action, and the other an ever-consuming, destructive chemical action that is not reversible. So putting in dry batteries gave a capacity of about a hundredth the required amount, and considering this, 1½ miles plus 40 rods was a respectable distance for you to travel.

If the new battery was connected in correctly according to polarity and the starting proposition gave more and more difficulty, the inference is the generator was not charging or the cut-out failed to cut in the generator on the line. The armature of the generator should be smoothed off with sandpaper and the mica between segments undercut. See that the brushes of the generator are bearing properly on the commutator surface. The circuit breaker, which is illustrated in Fig. 7, should be examined.

2—The battery was worn out by trying to start the engine. This reduced the specific gravity of the liquid in the battery to about 1.10 or thereabouts, which is just a little better than water and the freezing point about the same as water, so the natural result to be expected is just what happened. Renew the electrolyte, with a mixture made from 100 parts of distilled water and 30 parts of chemically pure sulphuric acid. Stir the water while adding the acid to keep the temperature low. Pour the acid into the water. Not the other way, as sputtering is apt to occur, which will burn and destroy whatever the acid comes into contact with.

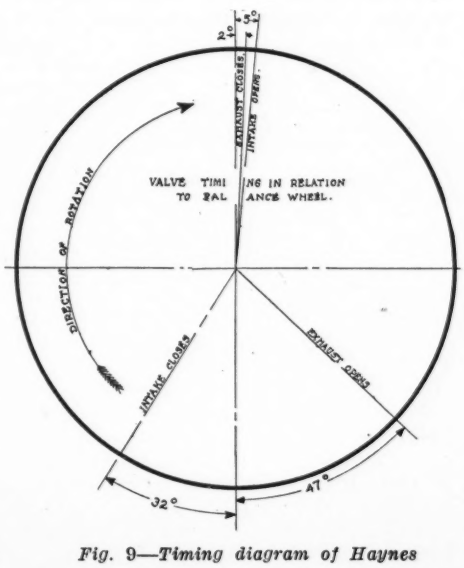


Fig. 9—Timing diagram of Haynes

Genemotor Principle Explained

Q—Publish diagram of internal winding and connections of Genemotor with explanation of theory of third-brush regulation.
2—Publish diagram of proper connections for ammeter to show when generator is charging.—Joseph Maguire, Dillon, Mont.

We have no internal diagrams of the Genemotor that show the complete starting and generating circuit in detail, but the principle of the system is shown in Fig. 8. In any shunt generator the field flux tends to pile up at the pole shoe where the armature passes out from under the pole piece. This tendency increases as the load increases, consequently the voltage that is impressed upon the shunt field also increases as the load becomes greater. To overcome this difficulty a third brush is installed between the other two brushes, and its position is out of the range of the distortion of the field. So when the load increases beyond safe limits, the field flux which has moved over to the pole shoe edge is not producing voltage for the field of the generator; consequently the voltage of the output drops.

2—In Fig. 6 is shown a small portion of the Genemotor circuit. Remove wire No. 8 and install in its place the wire A with the ammeter connected in as shown.

Wiring of Lozier 84

Q—Publish wiring diagram for my Lozier 84.—Michael E. Seitz, Cleveland, Ohio.

This is shown in Fig. 3.

Fuse Box on Hudson

Q—Where is the fuse box on a 1915 Hudson 54?
2—Publish wiring diagram.—Harry C. Johns, Ogden, Utah.

1—The fuse box is under the bonnet on the dashboard.

2—This diagram was shown in MOTOR AGE Dec. 5.

Salt Water Resistance

Q—What was the use of the salt water rectifier illustrated in the Sept. 13, 1918, issue?—R. J. Strauch, Verdon, S. D.

The salt water device was not a rectifier but a resistance to be used in charging Ford magnetos. It is the purpose of the salt water to furnish the extra resistance so the total current flow from a 110-volt circuit will be 30 amp.

Double Ignition on Empire

Q—Show the simplest way of putting double ignition on the T-head Teetor-Hartley four-cylinder engine on a 1918 Empire roadster.
2—Is the coil on this engine sufficiently large for a double-ignition system? I thought of tapping out the valve plugs over the exhaust valves to fit a spark plug and bringing a double wire out of each connection of the distributer head, one wire for each plug.
3—Is it possible to put a leather universal joint on this car similar to the one the Overland uses? If so, how is this done?—C. R. McGinnis, Wichita Falls, Tex.

1—The simplest way to install a double ignition system will be the way you suggest. Perfect performance from an installation of this kind is doubted. A better way,

but much more complicated and expensive, is to install a magneto for the other set of plugs.

2—The capacity of the coil is too small for two sets of plugs. Even if it were large enough, uniform sparking would not result, because the path of least resistance will change from one plug to the other, depending on the condition of the gases. The plug gaps can not be adjusted exactly the same for each cylinder, so the one having the smallest gap will do all the sparking and the other plug will collect carbon.

3—Yes, a leather disk universal can be installed. Write to the manufacturer, Thermoid Rubber Co., Trenton, N. J., or the Uniflex Coupling Co., Philadelphia, Pa., and state what you want, giving exact dimensions of the shaft, the splines on the shaft and the maximum horsepower to be transmitted, which for your case is about 40.

Ammeter Reserves Reading

Q—What causes an ammeter to show discharge when the generator charges and vice versa when on discharge? I changed the wires on ammeter to show correctly and after the car is run for some time it will reverse charging again. The battery is connected correctly. This happens on a Dodge and Apperson.

2—What is the difference in the amperage of high-tension current of 10,000 to 15,000 volts from a magneto and that from a generator furnishing current for city lights of, say, 2200 volts? No harm seems to come of a shock from the magneto, while the current from the city generator of 2200 probably would do harm.—C. T. Reeser, Lorington, Ill.

1—This is a very peculiar trouble. If the battery retains its charge and you are sure the generator is charging, which seems to be the case, then the trouble is in the ammeter. Try connecting in another instrument, and then examine the old one. See that there are no loose connections which could cause a reversal of the polarity.

2—The current from the light source is alternating continually, while the current from the magneto flows in one direction during the period of the spark but reverses at the next spark. A shock from a magneto is generally from one spark which is in one direction, unless the spark plug of the cylinder next in the firing order is touched. The lighting current reverses about sixty times a second, and it is this rapid reversal that makes the shock so dangerous.

Rebuilt Storage Batteries

Q—Can a storage battery be rebuilt when all the acid has leaked out?

2—What do you use to make the acid, and how?—S. T. Fry, Oak Hill, Ohio.

1—Yes, provided the plates are in good enough condition to warrant the expense. This can be told on examination by a battery man. If the acid has leaked out, it is safe to say the cells also are gone. If new cells, new plates and new electrolyte are required, it will be far cheaper to buy a new battery. At best, rebuilt batteries can last only a short time. It is a job that cannot be performed except by a competent battery house.

2—Sulphuric acid is used, in combination with distilled water, to give the right proportion and the correct gravity.

Motor-Generator On Mitchell

Q—Is the dynamo on a 1915 Mitchell still manufactured?

2—Where is the factory?

3—Will it overhaul an old machine on which the armature is burnt out?

4—What is the approximate cost of a new motor dynamo?—J. W. Kelly, Columbia, S. C.

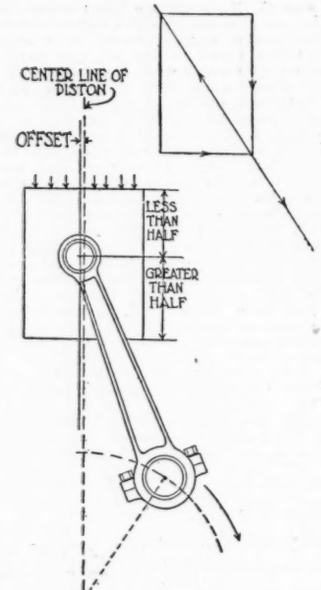


Fig. 10—Piston offset to prevent slap

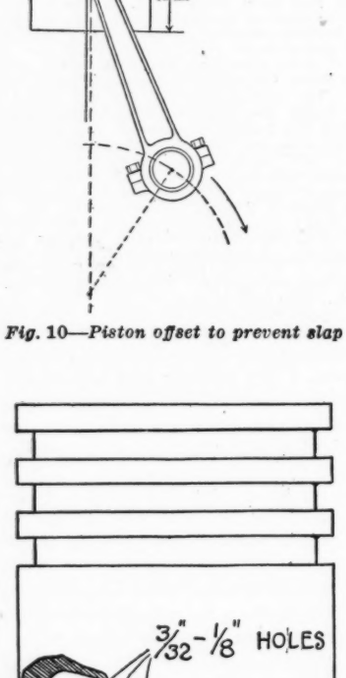


Fig. 11—How oil grooves should be drilled in piston

1—Yes. By the Splitdorf Electrical Co.

2—Newark, N. J.

3—Yes.

4—This is an old type of generator, and the price probably would run higher than ordinary, possibly as high as $100.

Engines

Piston Offset on Buick

Q—It is stated that the Buick and most cars offset the wristpin in the piston to overcome piston slap. Supposing the pistons were taken off the connecting rods, how should they be replaced? Should the heavy side of the pistons be on the right or left side of the engine in the cylinders, considering that the engine always turns to the right?

2—How many poppet-type valves of a different degree of face, or seat, are made? Is there a 90-deg. valve? If so, illustrate same. Also, a 30-deg. face and 40-deg. face or seat.—C. T. Reeser, Lorington, Ill.

1—The piston can be replaced on the connecting rod without regard to position. In placing the piston and rod back into the cylinder be sure to have the heaviest side of the piston to the right. If the illustration in Fig. 10 is studied, it can be seen that the side thrust must be counterbalanced in some way. Since the wristpin is nearer the top of the piston than the bottom, it follows that the intensity of pressure is greater at the top than at the bottom. This will tend to turn the piston in a counter-clockwise direction, so if the greater area is on the right side of the piston, the tendency will be to turn the piston in a clockwise direction, or if the offset is calculated accurately, the two turning forces will nullify each other.

2—Manufacturers of cars now are using 45-deg. angles on valve seats. There are no poppet valves using a 90-deg. seat. Some of the older cars have valves of 30 deg. This small difference could not be discerned in a photograph.

Timing 1916 Haynes

Q—Publish instructions for timing a 1916 Haynes 36.—Charles Hetherington, Bentleyville, Pa.

The timing diagram is shown in Fig. 9.

Torque and Horsepower Curves

Q—Explain the difference between torque and horsepower curves, such as that of the Essex recently printed in MOTOR AGE. I do not understand how the torque curve of an engine may be nearly flat while the horsepower curve will be decidedly different.—C. C. Denny, Seattle, Wash.

Theoretically, the torque curve of a gas engine is flat, and the horsepower varies directly as the speed. These conditions are ideal and are never approached in practice. The interferring conditions are: volumetric efficiencies, gas leakage, improper carburetion, varying temperatures, etc. These conditions are nearly constant in all engines as can be gleaned from the observation of many charts. The peak of the torque curve in general will be between 1000 and 1400 r.p.m., depending on the speed design of the engine.

Pitted Intake Valves

Q—In grinding valves on a new Nash six, the intake valves were pitted but the exhaust were not. What is the cause of that?—Ray Barlow, Sharpsville, Ind.

The most likely thing is that moisture has accumulated on the valves, for it is unusual to find the intake valves pitted where the exhaust valves are all right; usually it is the other way around. There is a certain amount of water in all gasoline and with a rather heavy mixture naturally some of this might lodge on the valve seats and the valves themselves.

Piston Rings in Northway

Q—What is the size of the cylinder rings in the Northway engine 4½ by 5¼?

2—Is it better to use the top ring with a bevel face on outside at top of ring or a square face?

3—What make of ring would you advise?—F. W. Dance, Lisbon, Iowa.

1—The rings are ¼ in. wide.

2—Some prominent engineers are advising an old-style ring on top and patented rings below. The slotted ring should have no beveled edges, but be square.

3—See the advertising columns of MOTOR AGE.

Difference in Buicks

Q—What is the valve timing of the model 10 Buick?

2—The face of the inlet valve cam is shorter than the exhaust. Would I gain anything by replacing the inlet cam with exhaust cams? If so, how should it be timed then?

3—The Buick C-25 engine seems to run much smoother than the model 10. Outside of the starter, where is the difference? Are the camshafts the same?

4—What is the gear ratio of the Hudson speedster?—Reader, Columbus, Ohio.

1—The inlet opens $\frac{5}{32}$ in. past the top center; inlet closes $\frac{17}{64}$ in. past bottom cen-

ter; exhaust opens 3½ in. before bottom center; exhaust closes ⅛ in. past top center.

2—It will be possible to use the exhaust camshaft and you will perhaps obtain more power, but it must be realized that this will cause a greater consumption of gasoline.

3—There have been several improvements on the model C25 over the model 10, such as one-piece camshaft, larger camshaft bearings, larger piston pins and bushings, different style of timing gears and other features. The model C25 was built five years ago and was, more or less, in the experimental stage.

4—The gear ratio of the sport model, which is probably what is meant, is 3 10/13 to 1.

Liberty in Cars

Q—What motor car uses the Liberty engine that the Government uses in airplanes?—Lee LaBrue, Byron, Okla.

No motor car uses the Liberty engine. While it is thought 3 miles a minute or 180 m.p.h. is entirely feasible with a 400-hp. Liberty engine—and many drivers would like to set such a record—as far as power to drive a car over the course is concerned, before such a thing would be possible, there must be new developments in wheels and tires so the car can hold together at this speed. In other words, the Liberty engine is too powerful as now designed for the rest of the car.

Valve Size on Engine

Q—What could the minimum size ports be in a four-cycle engine traveling at any speed?
2—For instance, how large must the ports be in an engine of 4-in. bore and 5-in. stroke traveling at 2500 r.p.m.?—James Krokosch, Canton, Ohio.

1—Port openings are the governing factors in determining the volumetric efficiency of an engine. Automotive engineers have been trying to bring this result up to higher and higher values. Witness the overhead valve construction, the four valves per cylinder, larger valves, better manifold design, all of which are attempts to increase the volumetric efficiency. Tests show that engines of some of the American cars develop volumetric efficiencies of not more than 70 per cent. Consequently the aim has been to get the valves as large as possible.

2—Not over 1⅞ in. in diameter.

Mileage Before Grinding Valves

Q—How far should the average car run before the valves are ground?
2—Is there a great deal of difference in the ordinary steel valve and the tungsten valve, and will the latter go very much longer than the former without needing to be ground?
3—Publish illustrations and descriptions of the various farm and isolated lighting plants on the market.—Reader, Albin, Miss.

1—Conditions will govern this matter, with some consideration being given the ability of the driver and the way he keeps his car. Off-hand, a car that is fairly correct in carburetion and ignition, that is not given an excess of oil and is not permitted to become overheated, should run in the neighborhood of 2000 miles without need of regrinding the valves or removing the carbon. But this is not necessarily a safe figure, inasmuch as the poorer the quality of gasoline and oil used, the more carbon will accumulate. Again it will depend on where the car is driven. In a city, where there is opportunity of driving only at moderate speeds, carbon will accumulate faster than when the car is driven in the country at fairly fast speeds, thus getting a chance to burn out some of the carbon, particularly around the exhaust valves and their seats.

2—Tungsten is harder than ordinary drop-forged steels and consequently is not so likely to pit, although we have seen valves made from this metal that did not serve as well as the cheaper grade that came with the car.

3—See the farm lighting table in the third issue of each month for specifications. Illustrations are appearing from time to time.

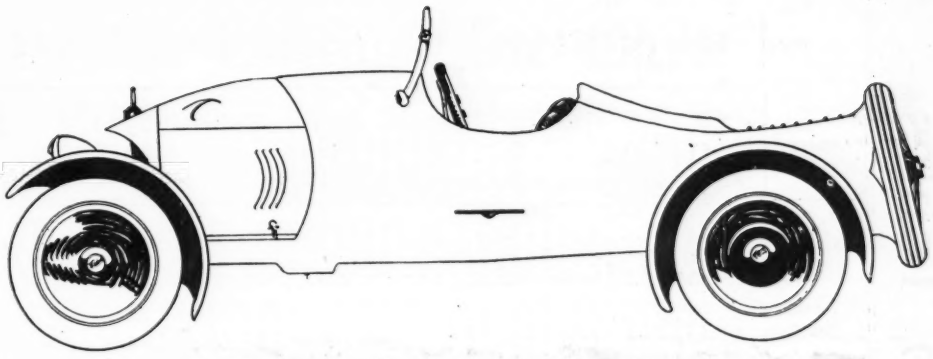


Fig. 12—Suggestion for novel racer on 1912 Chalmers chassis

Buick Valve Timing

Q—What is the correct valve timing for the 1912 model 35 Buick?—G. A. Henry, Andover, Ohio.

The inlet valve opens 3/32 in. after upper dead center and closes 1 7/64 in. after lower dead center. The exhaust opens 3½ in. before lower dead center and closes ⅛ in. past upper dead center. The valve lift should be ¼ in., the backlash 0.010 in. and the piston drive 3/32 in.

Rebuilding

Wants Rebuilt Racer

Q—I wish to build my 1912 Chalmers 30 into a chassis for dirt-track racing. Give information about wheelbase, kind of rear axle and gear ratio. I expect to use it on half-mile and mile tracks and want the gearing low enough so that I would not have any difficulty in driving cross-country.
2—What kind of oiling system is best to install in the engine?
3—Where can I get a racing camshaft to fit?
4—Advise on any other item in the construction of the car that you may have in mind that I have not already mentioned.—Robert H. Olsen, Omaha, Neb.

1—Rebuilding a car of this type and age calls for considerable experimenting and no little expense, as to get the best results you should have larger manifolds, a large carbureter and should also make the valve ports and valves as large as the metal will stand. In all probability the cylinders will have to be reground, new and lighter pistons of anuminum alloy made and carefully fitted, the connecting rods lightened by taking off all rough metal and boring.

A wheelbase of about 110 in. should be about right and a body design as shown in Fig. 12 would serve your purpose as well as being rather novel. Because of the age of the car it is not likely a gear ratio of more than 3 to 1 could be utilized, but you should have at least two sets of pinions and ring gears so that on a very bad track the lower gear could be used and on a hard and smooth track the higher gear could be substituted. This, too, will be determined by experiment until you know what the engine is capable of doing.

2—About the only oiling system you could install would be a tank and a pressure pump, so that any amount of oil could be driven into the crankcase. This is a simple form to utilize, calling for a pump to produce the pressure in the tank and a valve between the tank and base of the engine to shut off the oil when desired, the pump being placed handily for mechanic or driver.

3—The Chalmers Motor Co., Detroit, Mich., would be the logical concern to make the camshaft inasmuch as it has the drawings for the car and would know better what would be necessary. But if you determine the time of opening and closing the valves, almost any engine builder could turn out the camshaft.

4—All your pipe lines should be wrapped to prevent excessive vibration, and each joint should be soldered carefully. Soldering also applies to wire connections, and the liberal use of tape to protect wire joints should be resorted to. It will be necessary to tape the springs, shock absorbers should be fitted, and it is also customary to put on rebound stamps to hold the frame more or less rigidly with relation to the axles. A standard axle of any good make can be used, as long as the gear ratio is correct.

Ford for Racing

Q—What way should a Ford car be equipped to get the most speed out of it on a ½-mile dirt track?
2—What kind of a sixteen-valve head would you advise?
3—Is there any head built with two plugs to the cylinders?
4—Would three to one gear be best?
5—Would you advise Bosch ignition and Rayfield carbureter, and what size?
6—State what way a Ford car should be rebuilt and equipped, barring no expense to get the most possible speed.—B. Wellington, Casper, Wyoming.

1—This topic has been generously treated by MOTOR AGE not fewer than four or five times inside of a year and, in addition, the experiences of several readers have been given. We believe you will find all the details if you will consult MOTOR AGE of June 20-27 and Oct. 17 and also Feb. 13. These will be of help, because there are several illustrations of cars that have been converted into racers.

2—The Roof sixteen-valve head, made at Anderson, Ind., doubtless will serve your purpose.

3—Not that we know of.

4—This should be about right, but the experience of those who have made Ford racing cars will be the best thing to go by.

5—Bosch magneto and Rayfield carbureter will make a good combination, using 1¼-in. size of the latter.

6—This is answered in 1.

Motor Age Monthly Farm-Lighting Specification Tables

Name and Model	Maker	Watts capacity	No. 20 watt lamps	Lamp voltages	No. cyl'rs	No. cycles	Make of engine	Horsepower	Fuel	Cooling	Power pulley	Generator drive	Make of generator	Make of battery	Battery amp. hours	Battery, volts	No. cells	Starting engine	Stopping engine	Governor, type	Price
Aerothrust	Aerothrust Engine Co., La Porte, Ind	....	15–25	....	2	2	.....	3	.....	Air	Opt.	Shaft	.....	.....	60	28–42	.....	.....	.....	.....	.....
Alamo	Alamo Farm Light Co., Omaha, Neb	1000	75–120	40	1	4	Ide	1¼	.....	Water	.....	Direct	.....	.....	.....	.....	16	.....	.....	Throttle	.....
Alco	Automatic Light Co., Minneapolis, Minn	750	40	110	1	4	Alco	2	G	Water	Opt.	Direct	GE Alco	Willard	76	6	3	Auto.	Auto.	Electro sole.	$ 375
		850	55–75	32	1	4	Alco	2	G	Water	Opt.	Direct	GE Alco	Willard	80	32	.....	S-Auto.	Auto.	Electro sole.	450
Cushman, A	Cushman Motor Works, Lincoln, Neb	1000	20–70	32	1	4	Own	4	.....	Water	Yes	Belt	Imperial	.....	80	32	16	S-Auto.	S auto.	Throttle	.....
B		1000	25–75	32	1	..	Own	4	.....	Water	Yes	Belt	Imperial	.....	120	32	16	S Auto.	S auto.	Throttle	.....
E		1000	50–100	32	1	4	Own	4	.....	Water	Yes	Belt	Imperial	.....	180	32	16	S Auto.	S auto.	Throttle	.....
Delco, ¾ KW, 32 volt	Domestic Engineering Co., Dayton, Ohio	750	20–72	32	1	4	Own	1½	K	Air	No	Direct	Own	Exide	80–160	32	16	S-Auto.	Auto.	Voltage	425–490
3 KW, 32-volt		3000	150	32	1	4	Own	5	K	Air	No	Direct	Own	Exide	80–160	32	16	S-Auto.	Auto.	Voltage	900
3 KW, 110-volt		3000	150	110	1	4	Own	5	K	Air	No	Direct	Own	Exide	80–160	112	36	S-Auto.	Auto.	Voltage	1,200
Dyneto, 5	Dyneto Electric Co., Syracuse, N. Y	600	20–42	32	1	4	Novo	1½	.....	Water	Opt.	Belt	Own	Willard	53	32	16	S-Auto.	S-Auto.	.....	385
7		....	16–54	32	1	4	Novo	1½	.....	Water	Opt.	Belt	Own	Willard	80	32	16	S-Auto.	S-Auto.	.....	410
9		....	23–65	32	1	4	Novo	1½	.....	Water	Opt.	Belt	Own	Willard	110	32	16	S-Auto.	S-Auto.	.....	460
Fairbanks-Morse, F-3 hp	Fairbanks, Morse & Co., Chicago	900	13–100	30	1	4	Own	3	K	Water	.....	Belt	Own	.....	66	32	16	S-Auto.	Manual	.....	.....
F-6 hp		3500	40–200	30	1	..	Own	6	K	Water	.....	Belt	Own	.....	200	32	16	S-Auto.	Manual	.....	.....
Fairmont, B-4	Fairmont Gas E. & R. M. Co., Fairmont, Minn	....	50	32	1	2	Own	4	K & G	Water	Yes	Belt	W. E.	Edison	80	32	24	S-Auto.	Manual	Throttle	595
Garford	Garford Mfg. Co., Elyria, Ohio	600	16–62	30	..	..	Any	2	.....	.....	.....	Belt	.....	Gould	80	32	11	.....	Manual	.....	320
Genco, A	General Gas-Electric Co., Hanover, Pa	500	6–43	30	1	4	Own	2	Any	Water	Yes	Direct	Own	Own	110	32	16	S-Auto.	Auto.	.....	.....
B		600	10–59	30	1	4	Own	2	Any	Water	Yes	Direct	Own	Own	167	32	16	S-Auto.	Auto.	.....	.....
Jones, A	L. B. Jones Co., Kansas City, Mo	750	40	....	1	4	.....	.....	.....	Water	.....	Direct	.....	.....	.....	.....	.....	S-Auto.	Auto.	.....	.....
Lalley	Lalley Electro-Lighting Co., Detroit	1000	50	32	1	2	Own	1½	G	Water	.....	Direct	.....	Willard	115	32	16	Manual	Manual	Throttle	475
Lauson-Edison, 201	John Lauson Mfg. Co., New Holstein, Wis	800	7–30	50	1	4	Opt.	2½	Opt.	Water	Opt.	Belt	Own	Edison	38	50	26	Manual	Manual	Throttle	.....
202-30		1400	16–50	50	1	4	Opt.	2½	Opt.	.....	Opt.	Belt	.....	Edison	75	52	26	Manual	Manual	Throttle	.....
203–30		2000	22–75	50	1	4	Opt.	3½	Opt.	.....	Opt.	Belt	.....	Edison	112	52	26	Manual	Manual	Throttle	.....
206–110		3500	27–154	125	1	4	Opt.	4½	Opt.	.....	Opt.	Belt	.....	Edison	38	.....	94	Manual	Manual	Throttle	.....
Lauson Junior, 300		500	10–25	30	1	4	Opt.	1½	Opt.	.....	Opt.	Belt	Own	.....	40	30	15	Manual	Manual	Throttle	.....
301		800	15–40	30	1	4	Opt.	1½	Opt.	.....	Opt.	Belt	Own	.....	60	30	15	Manual	Manual	Throttle	.....
Langstadt-Meyer, 6	Langstadt-Meyer Co., Appleton, Wis	600	30–45	32	1	4	L-M	3	G	Water	Yes	Belt	L-M	.....	80	32	16	S-Auto.	Manual	Throttle	576
6½		1200	75	32	1	4	L-M	3	G	Water	Yes	Belt	L-M	.....	80	32	16	S-Auto.	Manual	Throttle	606
7		960	72	32	1	4	L-M	3	G	Water	Yes	Belt	L-M	.....	107	32	16	S-Auto.	Manual	Throttle	650
Main, 25-30 volt	Main Electric Mfg. Co., Pittsburgh, Pa	600	25–41	30	1	4	Own	1½	Opt.	Water	Yes	Belt	Own	.....	60	30	15	Manual	Manual	.....	375
40		800	40–56	30	1	4	Own	1½	Opt.	Water	Yes	Belt	Own	.....	95	30	15	Manual	Manual	.....	400
50		1000	50–66	30	1	4	Own	2½	Opt.	Water	Yes	Belt	Own	.....	95	30	15	Manual	Manual	.....	360
75		1500	22–97	30	1	4	.....	3½	Opt.	Water	Yes	Belt	Own	.....	130	30	15	Manual	Manual	.....	390
50		1000	25–75	110	1	4	.....	2½	Opt.	Water	Yes	Belt	Own	.....	40	110	55	Manual	Manual	.....	575
75		1500	38–113	110	1	4	.....	3½	Opt.	Water	Yes	Belt	Own	.....	60	110	55	Manual	Manual	.....	680
100		2000	60–160	110	1	4	.....	3½	Opt.	Water	Yes	Belt	Own	.....	95	110	55	Manual	Manual	.....	720
Marco	Marmon-Chicago Co., Chicago	1250	85–100	32	1	4	Newway	4	Opt.	Air	Yes	Chain	Dyneto	Perf't'n	.....	32	11	S-Auto.	.....	Electro-mag.	595
Matthews, A	Matthews Engineering Co., Sandusky, Ohio	1000	50	32	1	4	Own	3	G	Water	No	Direct	G-E	Willard	72	32	16	Auto.	Auto.	Electro-mag.	795
A-1		1000	50	32	1	4	Own	3	G	Water	No	Direct	G-E	Willard	72	32	16	S-Auto.	Auto.	Electro-mag.	695
B		2000	100	32	2	4	Own	7	G	Water	No	Direct	G-E	Willard	144	32	16	Auto.	Auto.	Electro-mag.	1,350
B-1		2000	100	32	2	4	Own	7	G	Water	No	Direct	G-E	Willard	144	32	16	S-Auto.	Auto.	Electro-mag.	1,250
C		1000	50	110	1	4	Own	3	G	Water	No	Direct	G-E	.....	.....	.....	.....	Manual	Manual	Electro-mag.	775
		2000	100	110	2	4	Own	7	G	Water	No	Direct	G-E	.....	.....	.....	.....	Manual	Manual	Electro-mag.	1,300
Mayhew, K 1	Mayhew Co., Milwaukee, Wis	800	12–40	32	1	4	.....	...	G	Water	Yes	Direct	Western	.....	80	32	16	S-Auto.	Manual	Flyball	475
K 2		800	16–48	32	1	4	.....	...	G	Water	Yes	Direct	Western	.....	125	32	16	S-Auto.	Manual	Flyball	510
K 3		800	22–54	32	1	4	.....	...	G	Water	Yes	Direct	Western	.....	160	32	16	S-Auto.	Manual	Flyball	550
Mor-Lite	Fairbanks, Morse & Co., Chicago	....	15–40	30	1	..	.....	...	G	Water	.....	Direct	.....	.....	.....	32	16	S-Auto.	Auto	Electro mag.	.....
Owen	R. M. Owen & Co., New York	1250	100	32	1	4	Own	1¼	G	Water	No	Direct	.....	.....	80	32	16	S-Auto	Auto.	.....	.....
Perfection, SA 1	Perfection Storage Battery Co., Chicago	1500	75	32	1	4	.....	3	Opt.	Water	.....	Direct	.....	Own	80	32	16	S-Auto.	Auto.	.....	600
FA 6		1500	65	32	1	4	.....	3	Opt.	Water	.....	Direct	.....	Own	40	65	32	Auto.	Auto.	.....	800
Powerlite, 163 L 65	Montgomery Ward & Co., Chicago	650	20	32	1	4	Own	2½	G	Water	Yes	Direct	Own	Own	60	32	16	S Auto.	Manual	Throttle	348
163-L-67		650	31	32	1	4	Own	2½	G	Water	Yes	Direct	Own	Own	90	32	16	S-Auto.	Manual	Throttle	365
163-L-69		650	41	32	1	4	Own	2½	G	Water	Yes	Direct	Own	Own	120	32	16	S-Auto.	Manual	Throttle	380
Rohaco, Unit	Roberts-Hamilton Co., Minneapolis, Minn	1500	75	32	1	4	Own	3	Opt.	Water	Yes	Direct	.....	Opt.	75–100	32	16–24	S-Auto.	Manual	Flyball	.....
A-1		500	13–40	40	1	4	Own	1½	Opt.	Water	Yes	Belt	.....	.....	60	30	15	S-Auto.	Manual	Flyball	*250
BE-1		800	30	50	1	4	Own	2	Opt.	Water	Yes	Belt	.....	Edison	75	50	24	S-Auto.	Manual	Flyball	*500
BE-2		1400	32–80	50	1	4	Own	3	Opt.	Water	Yes	Belt	.....	Edison	113	50	24	S-Auto.	Manual	Flyball	*600
B-3		2000	24–120	40	1	4	Own	5	Opt.	Water	Yes	Belt	.....	.....	120	32	16	S-Auto.	Manual	Flyball	*490
BE-3		2000	100	50	1	4	Own	5	Opt.	Water	Yes	Belt	.....	Edison	150	50	24	S-Auto.	Manual	Flyball	*750
Swanlite	Black Swan Co., Waseca, Minn	1000	50–100	....	1	4	Own	3	Opt.	Water	No	.....	.....	.....	60–160	32	16	.....	.....	.....	385–465
Swartz-Unit	Swartz Electric Co., Indianapolis, Ind	1000	50	30	1	2	Own	...	G	Water	No	Direct	Own	Opt.	88	32	16	S-Auto.	Manual	Electro-mag.	.....
E		1500	50	30	1	4	Own	...	Opt.	Water	Yes	Belt	Own	Opt.	88	32	16	Manual	Manual	Flyball	.....
F		2000	100	60	1	4	Own	...	Opt.	Water	Yes	Belt	Own	Opt.	88	64	32	Manual	Manual	Flyball	.....
Syco	Beaudette & Graham Eng. Co., Boston, Mass	1000	62-70	32	1	4	Own	3	G	Water	Yes	Direct	.....	.....	90-160	32	16	S-Auto.	Throttle	.....	.....
		4000	240-310	110	4	4	Own	8	G & K	Water	No	Direct	.....	.....	60-160	110	52	S-Auto.	S-Auto.	.....	.....
Uni-Lectric	Uni-Lectric Corp., Detroit	660	33	110	1	..	Own	...	.....	Water	.....	Direct	Own	.....	80	6	3	S-Auto.	.....	.....	472
Universal, 1-KW	Universal Products Co., Oshkosh, Wis	1000	150	32	1	4	Own	...	G	Water	.....	Direct	.....	.....	80-130	32	.....	S-Auto.	Auto.	.....	435-495
4-KW		4000	200	32	1	4	Own	...	G	Water	.....	Direct	.....	.....	130	32	.....	S-Auto,	Auto.	.....	975
West. Elect., 15-DC-90	Western Electric Co., New York	1500	75	32	1	..	Own	3½	K	Air	Yes	Direct	Own	.....	90	32	16	S-Auto.	Auto.	Throttle	.....
15-DC-180		1500	100	32	1	..	Own	3½	K	Air	Yes	Direct	Own	.....	180	32	16	S-Auto.	Auto.	Throttle	.....
Winton	Winton Eng. Works, Cleveland, Ohio	5000	250	115	4	4	Own	...	.....	Water	.....	Direct	Own	Opt.	Opt.	Opt.	Opt.	.....	.....	.....	.....
Wisconsin, 15-light	Lauson-Lawton Co., De Pere, Wis	450	12	30	1	..	Own	2½	.....	Water	Yes	Belt	Own	.....	36	26	13	Manual	Manual	.....	.....
30-light		600	24	32	1	..	Own	2½	.....	Water	Yes	Belt	Own	.....	36	32	16	Manual	Manual	.....	.....
50-light		800	40	32	1	..	Own	2½	.....	Water	Yes	Belt	Own	.....	60	32	16	Manual	Manual	.....	.....
100-light		1500	80	32	1	..	Own	4	.....	Water	Yes	Belt	Own	.....	100	32	16	Manual	Manual	.....	.....

*Without engine. Opt., optional. S-Auto., semi-automatic. K, kerosene. G, gasoline. Electro-mag., electro-magnetic.

Sizes of Brake Linings for Cars

Motor Age Maintenance Data Sheet No. 34

One of a series of weekly pages of information valuable to service man and dealer—Save this page

1912 Models

Car and Model—	INTERNAL Length	INTERNAL Width	INTERNAL Thickness	EXTERNAL Length	EXTERNAL Width	EXTERNAL Thickness
Cadillac—All	54	2½	3/16	51	2½	3/16
Case—M	43 5/8	2½	3/16	39¾	2½	3/16
Crawford—All	41	2	3/16	41	2	3/16
Cunningham—J	44	2½	3/16	39 7/8	2½	3/16
Dorris—G	43½	2½	3/16	40	2½	3/16
Empire—25	27½	1¾	3/16	29½	1¾	3/16
Ford—T	23⅜	1⅛	5/32	No lining		
*Franklin—						
G 1 & 2	30	2	5/32	...	...	...
	19	3	3/16	...	...	...
M1, M2 & G2	35 1/16	2⅝	5/32	...	...	...
	23 7/8	4	3/16	...	...	...
H1, H2 & D2	44 3/32	3	5/32	...	...	...
	28 3/16	4	3/16	...	...	...
Glide—36-42	41	2	3/16	41	2	3/16
Haynes—21 & 22	43½	2½	3/16	41¼	2½	3/16
Hudson—33	35 1/16	1⅞	5/32	35⅜	1⅝	5/32
Hupmobile—C	...	...	...	13	1	7/32
Inter-State—40	40	2	3/16	38	2	3/16
KisselKar—All	34⅜	4	3/16	38	3½	3/16
Lenox—All	13	1¾	3/16	13	1¾	3/16
Locomobile—All	21⅞	3	3/16	14 15/32	2	3/16
†Lyons-Knight—K	49¼	2½	3/16	47¼	2½	3/16
McFarlan—All				43	1⅞	3/16
				41½	1⅝	3/16
Mercer—All	9½	3¾	3/16	14	2	3/16
National—All	43 11/16	2½	3/16	41½	2	3/16
Oakland—40	30⅛	1⅞	5/32	30 1/16	1⅝	5/32
Oldsmobile	48	2½	5/32	47	2½	5/32
Overland—58 & 59	26 13/32	2	5/32	28	2	5/32
Overland—60	33⅞	2	5/32	35 13/16	2	5/32
Overland—61	40	2½	3/16	42	2½	3/16
Packard—18 & 30	12 7/16	2⅜	¼	No lining		
Packard—1-48	46⅜	2½	¼	No lining		
Paige—25	28 9/16	1⅞	5/32	29¼	1⅝	5/32
Peerless—All	44	2¼	¼	...	...	...
Pierce-Arrow—6-66	18¾	3¼	3/16	16⅞	3	3/16
Pierce-Arrow—6-48	18¾	3¼	3/16	16⅞	3	3/16
Pierce-Arrow—6-36-38	15¼	3	3/16	13⅝	2¾	3/16
Reo—R & S	43	2	3/16	38 13/16	2	3/16
Stearns—SK4 & 6	24	2¼	¼	17¾	2¼	¼
Studebaker—A	35 9/16	2	3/16	...	...	...
Studebaker—S	26½	2	3/16	...	...	...
*Stutz—A				14½	1¾	5/32
				14½	1¾	5/32
Velie—R	40¾	1⅝	5/32	39 13/16	1⅞	5/32
Velie—O	43⅝	2½	3/16	39¾	2½	3/16
Westcott—All	33	2¼	3/16	32	2¼	3/16
Winton—17C	44¼	3	5/32	42½	2½	5/32

*Transmission brake.
†Both brakes internal.

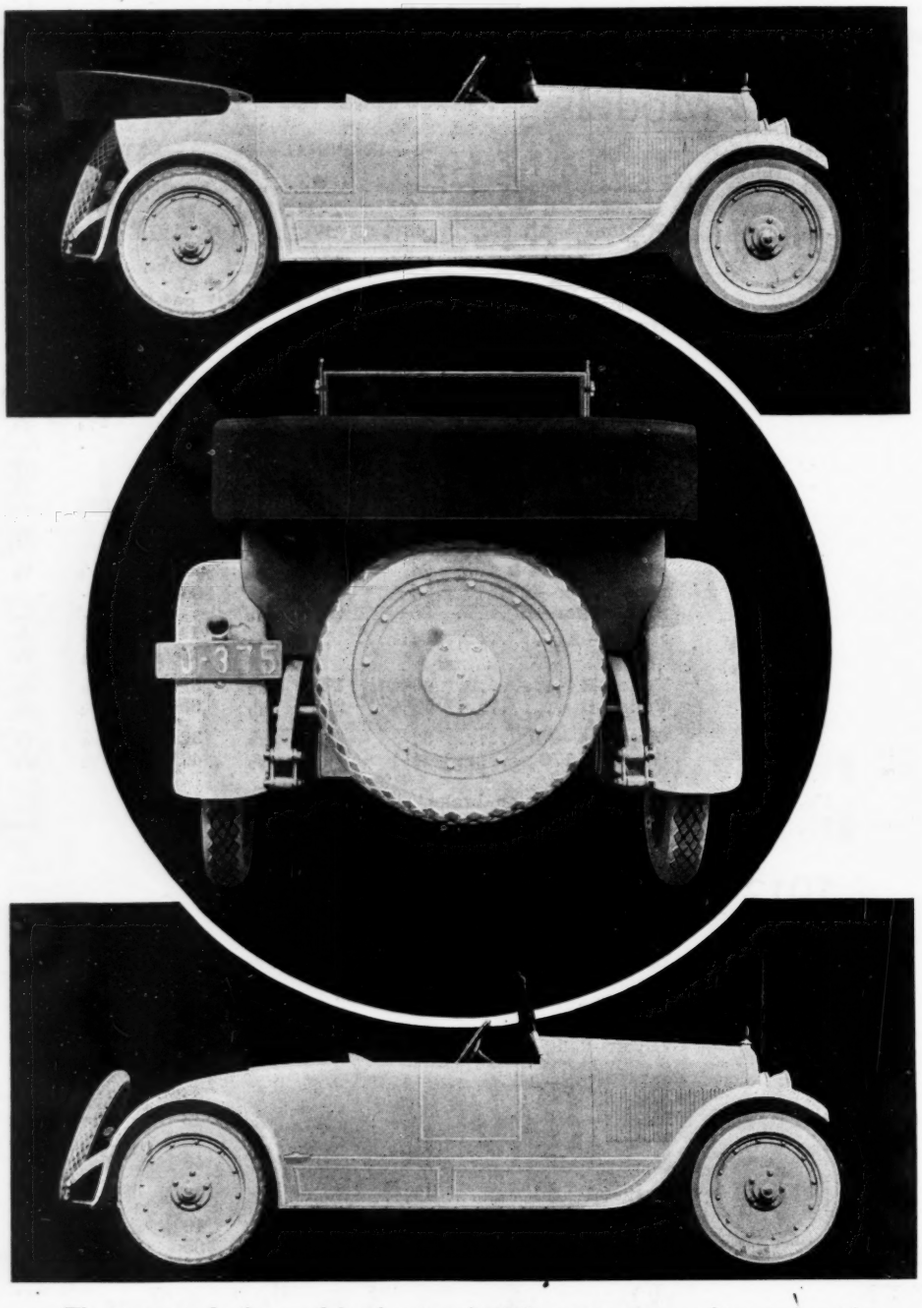
1913 Models

Austin—77	45	2½	¼	45	2½	¼
Cadillac	54	2½	3/16	51	2½	3/16
†Cartercar—5	42 7/8	1 5/16	3/16	41¼	1⅝	3/16
Case—O	48¾	2½	3/16	45⅜	2½	3/16
†Case—N	...	...	...	40 9/16	1⅝	5/32
†Chandler—All	...	...	...	15	1¾	5/32
Crawford—All	41	2	3/16	41	2	3/16
Cunningham—M	53½	2½	3/16	49	2½	3/16
Dorris—H	43½	2½	3/16	40	2½	3/16
E-M-F—6-35	36½	1⅞	3/16	36½	1⅞	3/16
Empire—31	36½	2	3/16	36½	1¾	3/16
Fiat—All	22	2½	¼	20	2	¼
*Ford—T	23⅜	1⅛	5/32	No lining		
*Franklin—M-3	35 1/16	2⅝	5/32	...	...	...
	23 7/8	4	3/16	...	...	...
*Franklin—D3-H3	44 3/32	3	5/32	...	...	...
	28 13/16	4	3/16	...	...	...
Glide—All	15½	1¾	⅛	15½	1¾	⅛
Haynes—23 & 25	49	2¼	3/16	48	2	5/32
Haynes—24	44	2¼	3/16	42	2	5/32
Hudson—54	50⅝	2 3/16	1/16	48⅝	1 15/16	1/16
Hudson—37	41⅜	1 15/16	3/16	41⅝	1 11/16	3/16
Hupmobile—H	36 3/16	2	5/32	31 7/16	2	5/32
Inter-State—50	46	2¼	3/16	44	2¼	3/16
Jeffery—93	41⅜	1¾	¼	...	...	...
	27⅞	1¾	¼	...	...	...
Jeffery—104	41⅜	2	¼	...	...	...
	28⅛	1¾	¼	...	...	...
King—B	42¼	2	5/32	19	2	5/32
				38½	2	5/32
KisselKar—All	34⅜	4	3/16	38	3½	3/16
Klinekar—All	101	2	5/32	75	2¼	5/32
Lenox—All	78	2	3/16	78	2	3/16
Lexington—All	48	2½	3/16	...	...	...
Locomobile—All	21⅞	3	3/16	14 15/32	2	3/16
†Lozier—27	46⅞	2	¼	34¼	2	¼
†Lozier—22 & 22A	43¼	2½	¼	40½	2	¼
†Lyons-Knight—K	49¼	2½	3/16	47¼	2½	3/16
†McFarlan—All				43	1⅞	3/16
				41½	1⅝	3/16
Mercer—All	9½	3¾	3/16	19	2	3/16
Metz—All	...	...	...	24	1	5/32
Moon—39-48	...	...	...	40	2	3/16
National—All	43 11/16	2½	3/16	41½	2	3/16
Oakland—42	16 11/16	...	5/32	16 11/16	1⅝	5/32
Oakland—35	35 1/16	1⅞	5/32	35	1⅝	5/32
Overland—All	41	2¼	3/16	10 3/16	2¼	3/16
Packard—2-48	43	2⅜	¼	No lining		
Paige—4-36	40	2	3/16	42¾	1¾	5/32
Paige—25	28 9/16	1⅞	5/32	29¼	1⅝	5/32
Peerless—All	44	2¼	¼	...	...	...
Pierce-Arrow—6-66	18¾	3¼	3/16	16⅞	3	3/16
Pierce-Arrow—6-48	18¾	3¼	3/16	16⅞	3	3/16
Pierce-Arrow—6-36-38	15¼	3	3/16	13⅝	2¾	3/16
Reo—R & S	43	2	3/16	38 13/16	2	3/16
Speedwell—G H	53½	2½	3/16	49	2½	3/16
Stearns—SK4 & 6	24	2¼	¼	17¾	2¼	¼
Studebaker—SA	29 7/16	1¾	3/16	...	...	...
Studebaker—AA	33 7/16	1¾	3/16	...	...	...
*Stutz—B				16½	1¾	5/32
				16½	1¾	5/32
Velie—All	43⅝	2½	3/16	39¾	2½	3/16
Westcott—All	33	2½	3/16	32	2¼	3/16
Winton—17D	44¼	3	5/32	42½	2½	5/32

*Transmission brake.
†Both brakes internal.

Jordan Adds Silhouette and Playboy

Chassis Improvements Made in Line



The two new Jordan models, showing the Silhouette at top and in circle with Playboy at bottom

FEATURES which previously have characterized custom-made bodies are incorporated in the new Jordan Silhouette just announced and concerning which there has been somewhat of a mystery for the last two weeks. Improvements in chassis design, embodying refinement of detail, and two new body types are included in the new line dominated by the Silhouette. This last comes as a four-passenger or seven-passenger, with the newest French angle at the dash, a cocky seat cowl and a perfectly straight-top edge. The companion new body style is the Jordan Playboy, a roadster spirited in appearance, which meets the growing demand for a two-passenger, with cockpit seat behind. This is to be limited in production, with delivery starting this month.

All the bodies are of aluminum with a new type of broad, wide-opening doors with outside hinges allowing the door to describe a complete half-circle. The moldings are of rectangular design and the fenders of the new deep section, full crowned.

The hood is a trifle higher, with twenty-nine louvres, and the sport-type windshield is tilted and built flush with the dash cowl. The body sides are deep, with cushions extremely deep and resting almost on the floor. The tilt of the cushions is much in excess of that of the ordinary cushion and provides for more comfort for the occupant.

Upholstery is of soft, bright hand-buffed leather with the new narrow French pleats. The instrument board is of metal, cushioned to eliminate squeaking and finished with complete nickel equipment. The tonneau of the four-passenger Silhouette carries a Cordovan leather boot and saddle bag. The lamps now are mounted inside the front fenders, eliminating rattles and providing substantial support.

Patented Spring Device

The chassis, which Jordan claims is the lightest on the road for its 127-in. wheelbase, has been improved in many details, chiefly for added strength and balance. A patented spring device similar to that previously only on the Crane-Simplex, is used. This consists of two coiled springs, one on each side of the main spring, with ground steel washers between the chassis spring and coiled spring to provide good wearing surface. A self-adjusting grease cover incloses the coiled springs, and the whole device is packed with graphite grease. The rear springs of vanadium steel have been designed to enable the Jordan to travel at high speed over rough roads, yet allow the car to be hung quite low.

Goodyear cord tires, extra size 32 by 4½, are now standard on all models. Disk and wire wheels are optional. Artillery wheels are standard equipment. The Silhouette is finished in Egyptian bronze and Burgundy old wine, while the Playboy is finished in scarlet and Burgundy old wine. The brougham and town sedan in Liberty blue or Brewster green complete the line.

NEW JUMBO MODELS

Saginaw, Mich., April 11—The Nelson Motor Truck Co. is just getting into production on a new 2-ton tractor. The tractor has a 108-in. wheelbase. All specifications are the same as the regular Jumbo truck. The tractor will be marketed in connection with 3-5 and 5-7 ton semi-trailers as a six-wheel unit for heavy duty work.

This company also proposes to bring out a new 3 ½-ton truck in about ninety days. The new truck will use Buda engine and Clark axles. The manufacture of the regular 2-ton model will be continued.

FARM LIGHTING TABLES

Chicago, April 14—Inability to have the farm lighting specification tables replated for this week's issue, owing to a strike, makes it necessary to call attention to these changes here:

The Lalley-Light sells for $495 now instead of $475.

Genco-Light uses a 2½-hp. engine and 32-volt 1-kw. generator.

PRICE OF KELLOGG PUMPS

Chicago, April 14—The price of the Kellogg pump No. 8 is $5 and No. 15 $3 instead of those given in the advertisement of the Kellogg Mfg. Co. in MOTOR AGE issue of March 13.

Sayers Gets Ready for Wider Trade

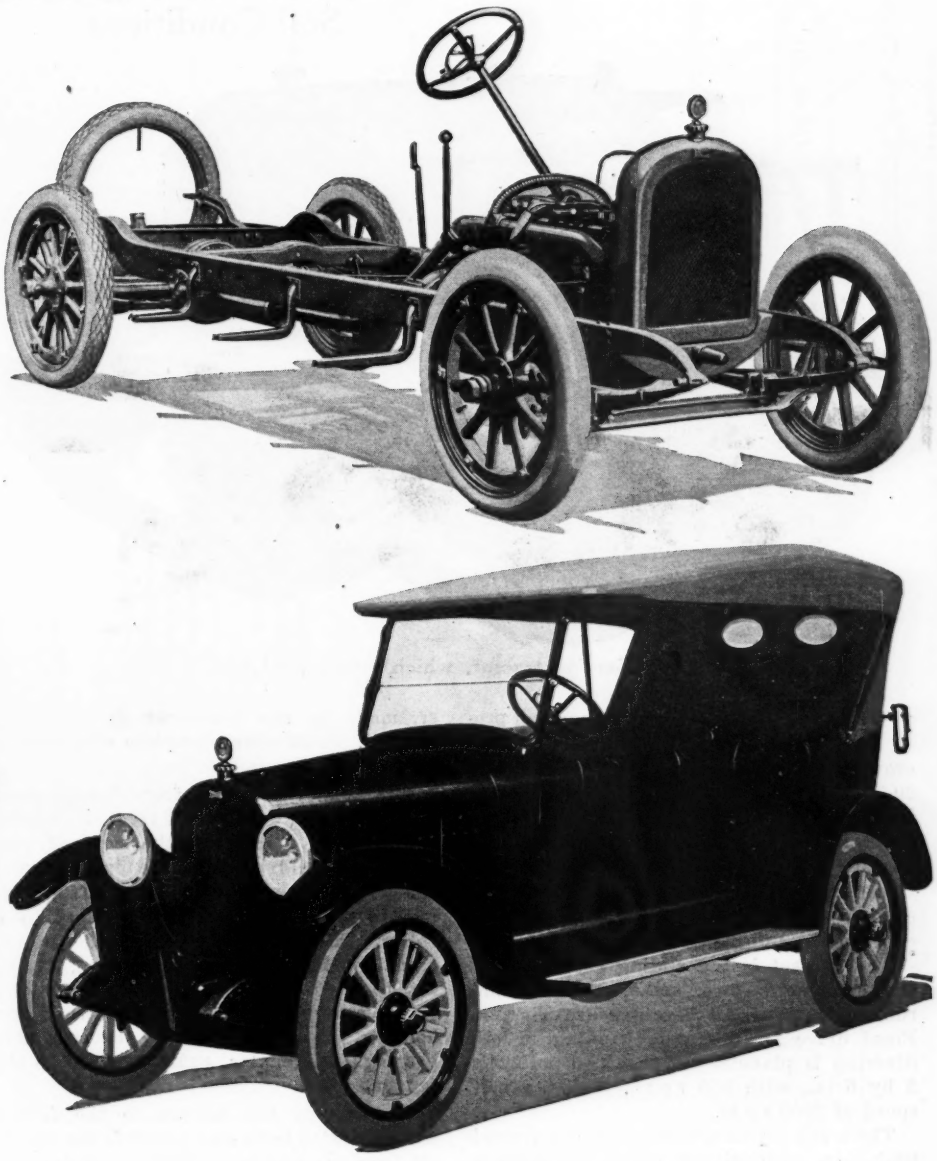
Increasing Production of Its Six

THE Sayers & Scoville Co., of Cincinnati, Ohio, has increased its production considerably during the last few months and is now making arrangements to extend its distribution. While the Sayers six has been sold in a limited way for the last two years only in central Ohio, Kansas and Missouri and some of the southern states, the maker is one of the oldest motor car builders in the industry. It has a forty-year business record and for twelve years has been making motor vehicles for a special trade.

Three years ago the company turned its attention to the production of a car to sell at a moderate price. The Sayers six is made from stadard units, such as Continental engine, Borg & Beck clutch, Stewart vacuum fuel feed, Stewart speedometer, Delco starting and lighting, Zenith carbureter and Moto-Meter. It is a lightweight car said to be economical in operation and sells for $1,695.

Car Well Built

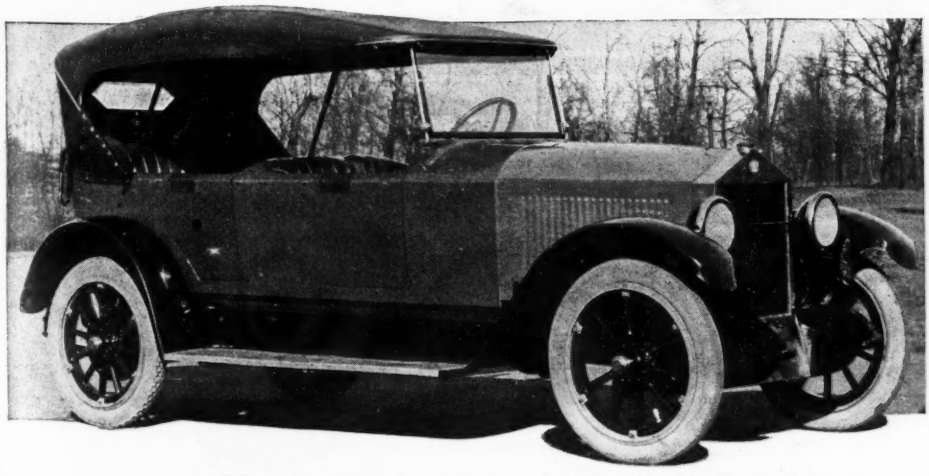
Throughout its construction the car is well built. For instance, the body work is done by a company which has had forty years' experience in building bodies for the finest type of coaches, carriages, ambulances, etc. Upholstery is of genuine leather. Painting is done by hand by methods which have had the same forty-year test of efficiency. Each coat of paint is registered and must dry thoroughly in a room of even temperature for a certain number of hours before the next coat is applied. In fact, while the car is a stock proposition, light weight and moderately priced, the same characteristics that distinguished the Sayers & Scovill custom-built bodies of these many years are present.



At the right are shown the Sayers chassis and complete car which the maker will produce for wider distribution now

Moon Brings Out Victory Model Light Six

THE Moon Motor Car Co. began production April 1 on a Victory model light six to sell at $1,685. The appearance of the Moon is completely changed, as the body lines are entirely new. The car is a five-passenger with bevel-type body, and for the first time in the history of the Moon company it carries a square Rolls-Royce type radiator.



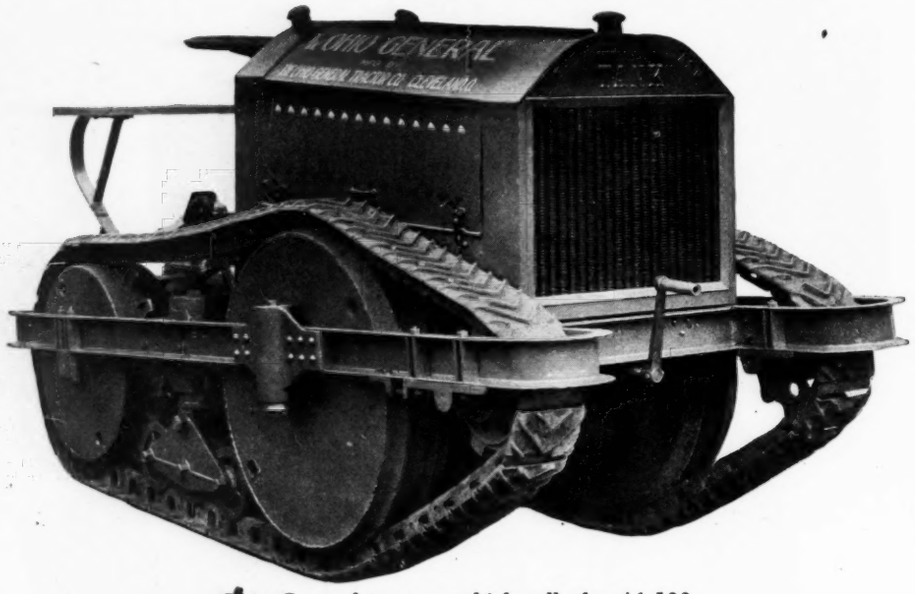
The Moon Victory model six which is to sell at $1,685

The body is fitted on a 118-in. wheelbase with tires 32 by 4 in. The engine is a 3¼ by 4½-in. six-cylinder. Standard units, such as Delco electric system, Rayfield carbureter, Brown-Lipe gearset, Spicer universal joints and Timken axles and bearings are used.

A great deal of effort has been spent in giving the car a low-hung effect. The seats are very low, and the springs, which are semi-elliptic in front and rear, have been designed to have a minimum travel. Upholstery is of the tan Spanish leather used by Moon for the last five years. The one-man top is accompanied by doors with curtain arrangements to open with them. Solid walnut instrument board and rear cowl blend well with the tan upholstery.

Tractor Uses Water to Change Weight

Varies Filling of Hollow Wheels to Meet Soil Conditions



Ohio General tractor, which sells for $1,500

THE Ohio General is a tractor which presents some novel features. It is a crawler type of machine with a rating of 20-30 manufactured by the Ohio General Tractor Co., Cleveland, Ohio. It has a Buda, four-cylinder, vertical, 4½ by 5½-in. engine, which burns gasoline or kerosene. Dixie magneto, Bennett carbureter and air cleaner and Pierce governor are regular equipment. Lubrication is force feed.

The gearset is the sliding gear type of the company's own make, inclosed and running in oil. All bearings are Timken. Final drive is live axle, running in oil. Steering is planetary type. The pulley is 8 by 6 in., with 850 r.p.m., giving a belt speed of 2000 r.p.m.

The track layers are 48 in. on the ground with 8-in. face, giving 760-sq. in. surface contact. The length of the machine is 88 in.; width, 54 in.; and height, 50 in. It has three forward speeds, 2, 3 and 4 m.p.h. The diameter of the turning circle is 8 ft. The price is $1,500.

The unusual feature of the Ohio General is the water ballast which enables the operator to change the weight of the tractor at will through a range of from 3500 lb. to 5000 lb. The two main idlers and the two traction wheels are of hollow construction. By filling these wheels with water the weight of the tractor may be so changed that it can meet any and all soil conditions, it is claimed. It is contended by the company also that if the idlers and drivers are charged with water the tractive power of the machine is correspondingly increased. The company claims this to be an economy, since water is cheaper than steel for making tractor weight.

Fordson Accessories

Fordson accessories are making their appearance, and one accessory is a fender, made by the Tractor Equipment Co., Detroit, which comes complete with canopy top. The price is $45.

The fender is made from heavy sheet steel, strongly welded and riveted, and fits over the drive wheel of the Fordson, providing a shield between the operator and the drive wheels clear to the rear axle housing, to which the fender is attached by a collar. The fender is braced rigidly at the front to the transmission housing, at the top to the support to the fuel tank and at the rear by two braces to the rear axle housing. A grease cup for the rear axle bearings is regular equipment with the fender.

The canopy top fastens to the fender without extra bolts and protects the operator from sun and rain. The canvas top can be tied up to the ridge rod when desired. In the future these tops will be furnished with side curtains by which the top can be converted practically into a closed cab.

Another Fordson accessory is one or a pair of electric spotlights which are attached by supporting bracket to the rear support of the fuel tank. Juice for these lights is obtained from the built-in magneto of the Fordson. The price is $15.

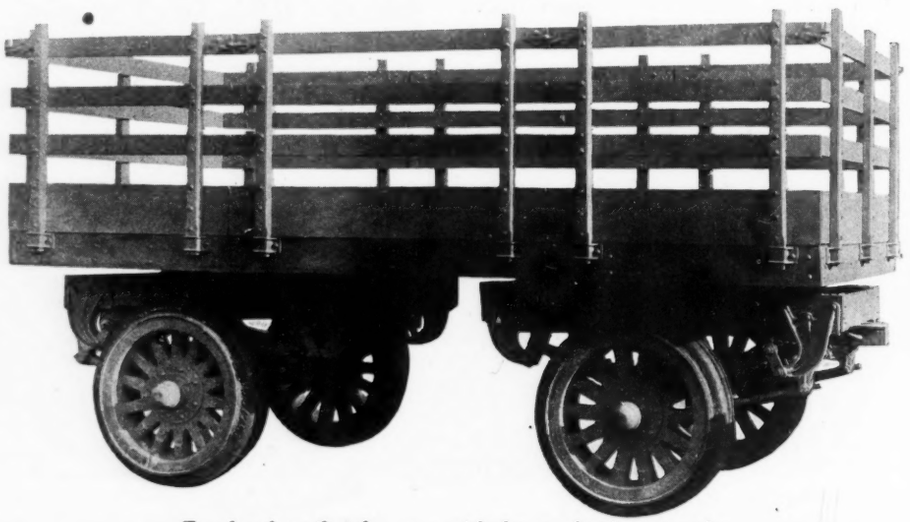
Fruehauf Trailer

THE latest addition to the line of the Fruehauf Trailer Co., Detroit, is a reversible four-wheel trailer for use with heavy haulage trucks. Two departures from ordinary trailer design are incorporated in the new model. The first is the use of double trucks, or two independent and reversible sets of running gear for carrying the frame. The second is the use of the circle-steer principle.

In addition to simplifying the construction and making for greater sturdiness, these two innovations in design eliminate what was formerly the greatest objection to the use of four-wheel trailers with trucks, the danger of the trailer snaking, failure to track the truck faithfully with the resultant strains and stresses on the truck.

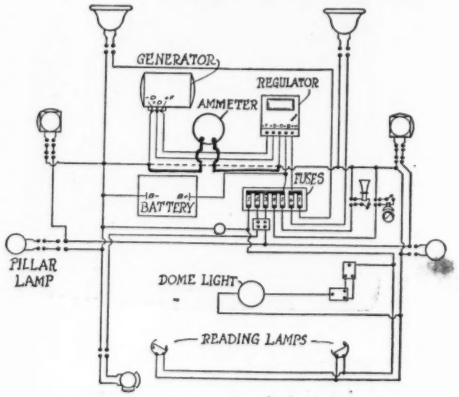
Double trucks, or gears, under the frame make possible better cushioning of the load, while the foundation for the body is built in the frame itself. The springs are relieved of the strain of hauling the load, the load being pulled through the dead square axle of the front truck under the frame. Radius rods absorb all thrust, further relieving the springs of any strain other than that of cushioning the load.

The construction of the double trucks permits placing the springs 11 in. farther apart, it is advanced, than is customary, enabling the axles to carry about 1000 lb. more. The frame construction provides the foundation of any type of body, allowing the floor to be built flush with the top of the channel frame and adding to the strength and rigidity of the frame.

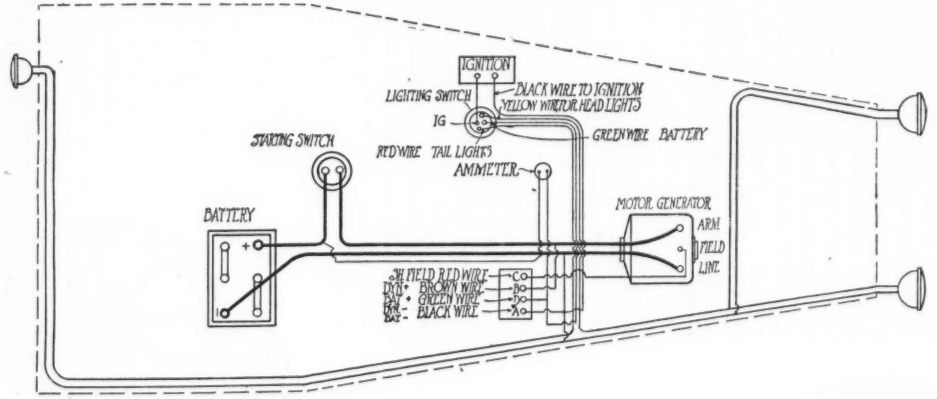


Fruehauf trailer for use with heavy haulage trucks

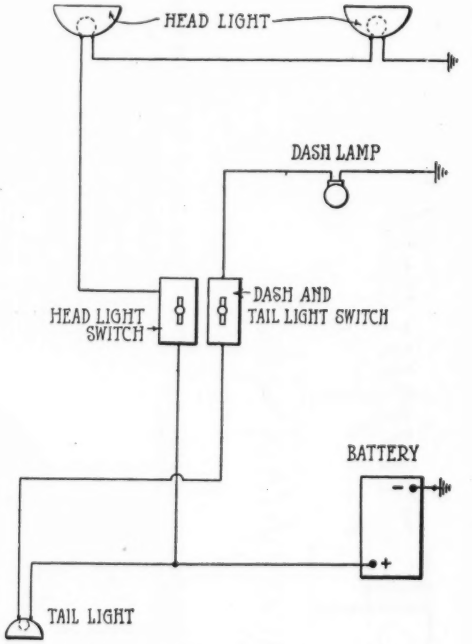
Motor Age Wiring Diagram Chart No. 24



Adlake system on 1913 *Locomobile*

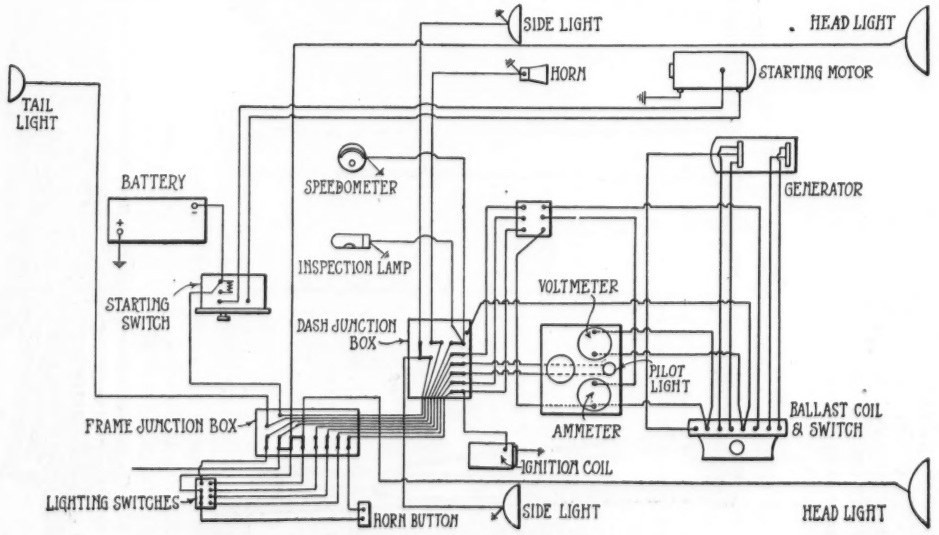


Detroit-Ward Leonard system on 1915 *Saxon*

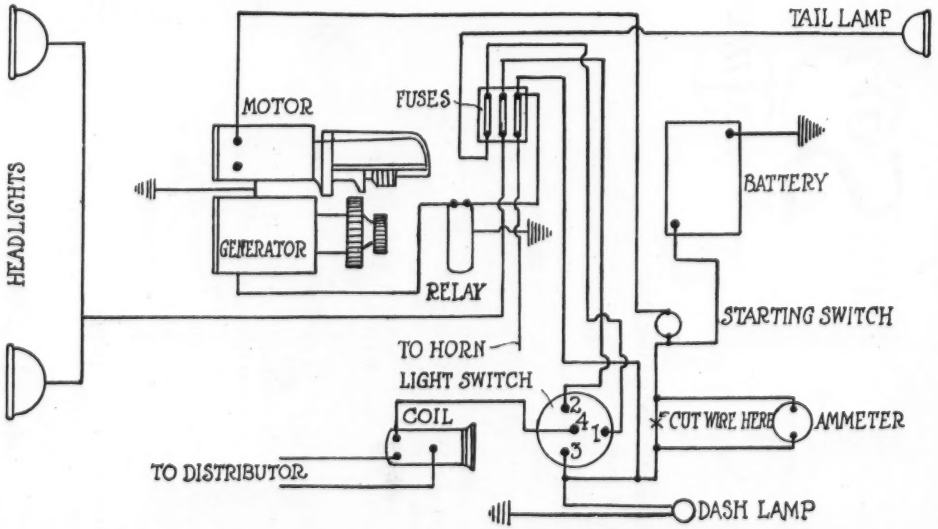


Wiring of lights on Saxon roadster

Abbott—March 20-27
Alter—Nov. 14
Apperson—March 6
Buick—Nov. 21-April 3
Cadillac—Dec. 19
Cole—Jan. 23-April 3
Case—Feb. 27
Chalmers—Feb. 20
Chandler—April 3
Chevrolet—Nov. 28-March 27
Detroiter—March 6
Dodge—Dec. 12
Dort—March 13
Elgin—Feb. 27
Empire—March 13
Ford—Jan. 30
Grant—Feb. 27-March 27
Henderson—April 3
Hudson—Dec. 5
Hupmobile—Feb. 13
Interstate—March 13
Krit—Feb. 6
Little—March 20
Locomobile—Jan. 23
Marion—March 6-20
Marmon—Jan. 9
Maxwell—Jan. 16
Mercer—Jan. 23
Michigan—March 20
Mitchell—Jan. 9
Oakland—Jan. 2
Oldsmobile—Jan. 23
Overland—Nov. 7-14
Premier—April 10
Pullman—April 10
Regal—Feb. 6; April 10
Reo—Feb. 27
Scripps-Booth—Dec. 26
Studebaker—Dec. 26



Rushmore system on 1914 *Simplex*



Wagner system on 1918 *Saxon, showing ammeter connections*

Service Equipment

Time Savers of the Shop

Automatic Extension Reel

AN automatic reel for the exension lights in the service station is made by the Cincinnati Specialty Co., Cincinnati, Ohio. The fact that it has been approved by the Underwriters' Laboratories makes it sure that there is no fire risk in connection with its use in a garage or service station. The reel holds 25 ft. of reinforced packing house cord, and the spring which winds it is controlled by an automatic device similar to that found cn roller shades.

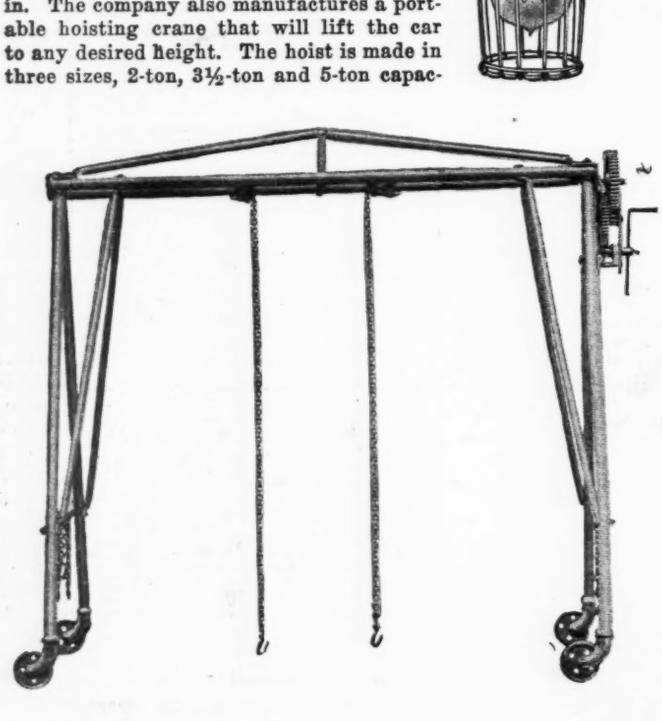
Automatic reel for the extension lights in service stations

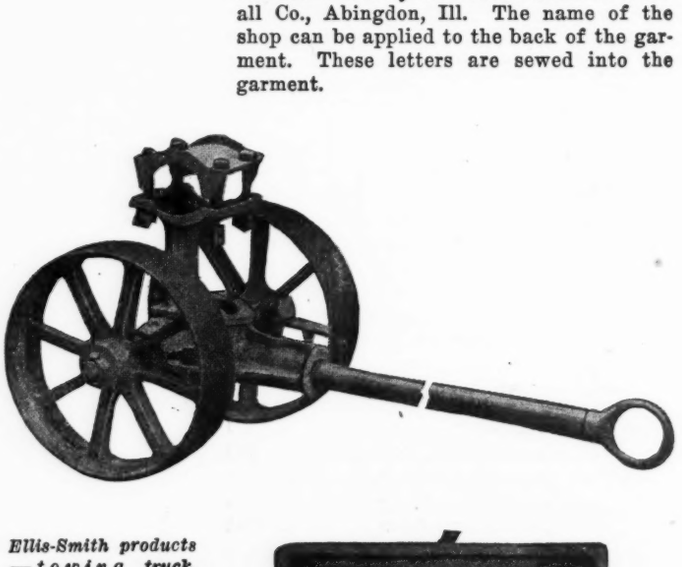
Ellis Smith Products

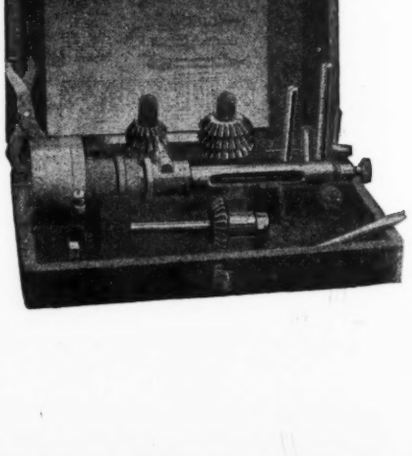
The Ellis Smith Mfg. Co., Inc., Elmira, N. Y., is manufacturing several devices of value to the shop. The towing truck belongs to the regular equipment of the service truck. It is a heavy-duty affair for light trucks and cars, operating from either axle. The wheels are large, 14 in. in diameter, and equipped with roller bearings. The tires are 4 in. wide, which insures ample surface for soft road conditions. The towing pole is heavy and 10 ft. long. It is arranged with a loop in the end which can be placed in the towing shackle of the repair truck. The height of the raising device is adjustable from 8 to 18 in. The company also manufactures a portable hoisting crane that will lift the car to any desired height. The hoist is made in three sizes, 2-ton, 3½-ton and 5-ton capacity. These hoists are collapsible and can be loaded on the service car and assembled wherever occasion demands. All are equipped with a differential chain hoist or a gear reducing mechanism so that a small pressure applied to the crank will lift the car easily. The hoists are mounted on swivel casters which on the 5-ton hoist revolve on rolling bearings. One of the features of these hoists is that they permit of one-man operation. The fitting of the front axle is ordinarily a two- or three-man job, but by application of this hoist one man can do the work. The valve dresser and reseater made by this concern cuts valves and faces seats at any desired angle. It is not a power-driven grinder but is operated from an ordinary brace. The set comes complete with cutters to meet the requirements of all cars.

Protextall Overalls

The value from a sales standpoint of the attire of the maintenance force is self-evident. The man who drives up to a shop where the men are attired in a business-like manner and ready for work is considerably impressed. Therein lies the value of the overalls made by the Globe Shirt & Overall Co., Abingdon, Ill. The name of the shop can be applied to the back of the garment. These letters are sewed into the garment.







Ellis-Smith products —towing truck, above; hoist, collapsed and upright, left; and valve dresser and reseater in box

The Accessory Corner

New Fitments for the Car

Engine Support

THE Motor Support Co., 431 South Dearborn street, Chicago, is making a device that offers additional support for the Ford engine. The support clamps on under the flywheel housing and to the frame of the car. Beside supporting the rear part of the engine, the clamp offers a permanent repair for a broken case arm.

Radium Dials

The Radium Dial Co., Forbes & Meyran avenue, Pittsburgh, Pa., prepared to supply dealers who handle instruments and accessories for motor cars requiring illumination dials, or markers, that require no illumination. The figures and graduations on the dials are treated with Luma radium compound which gives to them a glowing effect in the dark.

Defender Shock Absorber

The Defender Auto Lock Co., Detroit, is making a shock absorber for Fords that gives a compound spring action to the Ford cross spring. The upper end of the spring is provided with a roller that bears on the second leaf of the Ford spring, so that in flexing this roller moves over the old spring and so tends to prevent the rebound action. The absorber is easily applied with a wrench.

Victor Spark Plug

The Victor spark plug has a gap which can be adjusted while the engine is running. The illustration shows how this is done. Remove the sight plug and with a screwdriver turn the small adjusting screw. The plug is equipped with a priming cup that drops gasoline directly on the electrodes. An advantage claimed for the plug is the combustion chamber. Here, it is said, the gas first is ignited and then forced out into the combustion chamber with great violence. The plug is made by the Victor Spark Plug Co., Boston, Mass.

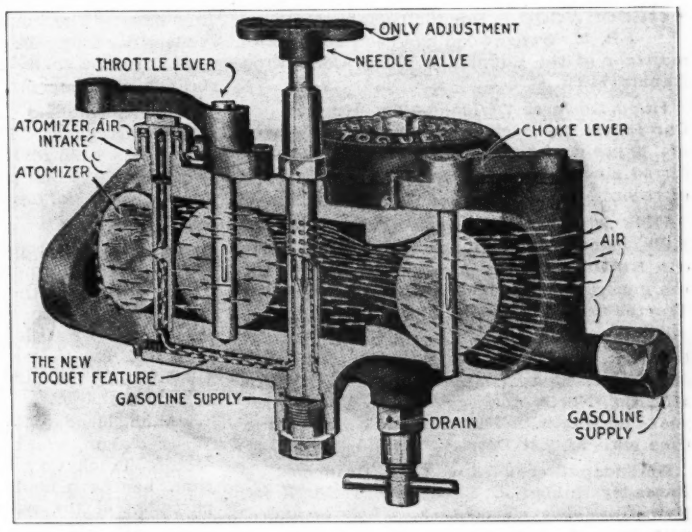
Toquet Carbureter

A new one-adjustment carbureter for Fords is being made by the Toquet Mfg. Co., Westport, Conn. The principle of this carbureter is different from others in that the air first is mixed with the volatile parts of the gasoline and then passes along to the atomizer air intake. Here the carbureter mixture is met by a new mixture which contains the portions of the gasoline that did not volatilize. This new mixture is atomized, mixed with the already carbureted gas and then passed along to the intake manifold. The carbureter sells for $15.

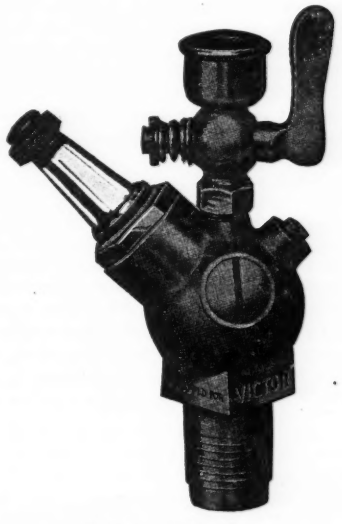
Safety Tire Valve

The Automatic Safety Tire Valve Corp., Long Island City, N. Y., is making a necessity for the motorist and the truck user, if the trucks are pneumatic-equipped. Air service at the garage is generally at 125 to 150 lb. pressure. People drive up and inflate their tires to a pressure of 90 and 95 lb. when they should only be inflated to 70 or 80 lb., resulting in blowouts, especially if the tire is an old one and has been through a lot of rough riding. This gage is automatic. It is attached to the end of the air hose and screwed into the tire. It is set for the proper pressure, and as soon as the tire is inflated to this pressure the gage pops off like a safety valve and blows the whistle.

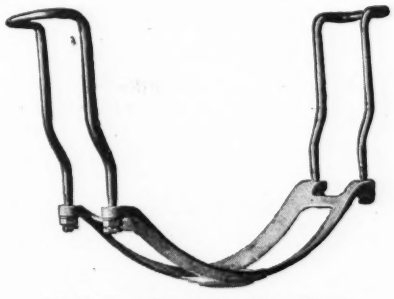
Safety tire valve



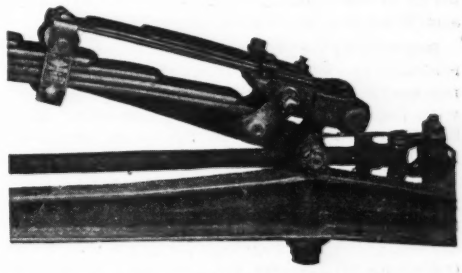
Toquet carbureter, showing adjustment



Victor spark plug



Liberty engine support for Fords



Defender shock absorber for Fords

Beveled Glass

To meet the demand for rear curtains equipped with beveled plate glass, the Cincinnati Auto Specialty Co. is now making a standardized plate glass that will fit any car. The glass is clamped in a nickle-plated brass ring and so arranged that the weight of the glass is not supported by the fabric of the curtain, which otherwise would cause the fabric to become bulged and wrinkled. The glass is made in two sizes, both oval, 10 in. by 6 in. and 14½ in. by 7¾ in.

Conservo Vaporizer

The vaporizer made by Conservo Sales Co., Inc., 225 Fifth avenue, New York, is so constructed that it breaks up the liquid fuel as it passes from the carbureter to the manifold. It is inserted by removing the bolts which connect the carbureter to the manifold and inserting the vaporizer with the mixing head projecting into the manifold. It is made in various sizes to fit different carbureters. The price is $5.

Among the Makers and Dealers

Short Trade Notes

WEDGEWOOD Is Simplicity Sales Manager—R. M. Wedgewood has been made sales manager of the Simplicity Wheel Co., Grand Rapids, Mich.

Hupp Declares Dividend—The Hupp Motor Car Corp., has declared a quarterly dividend of 1¾ per cent on 7 per cent cumulative preferred stock, payable April 1 to stockholders of record March 20.

Hills with Ohio General Tractor—George Hills, manager of factory sales of the American Rolling Mill Co., has resigned to accept the general management of the Ohio General Tractor Co., Cleveland, Ohio.

Higginbotham with Oklahoma Concern—Herbert Higginbotham has been appointed district sales manager for the Oklahoma Auto Mfg. Co., North Muskogee, Okla. For several years he was with Paige and also was at one time with Abbott-Detroit.

Braender Closes New York Branch—The Braender Rubber & Tire Co. has closed its New York branch office and has arranged with Ryan & Hughes, Inc., to act as distributers in New York, Brooklyn, Staten Island and Westchester county, New York.

Sudduth to Represent Ranier Truck—E. W. Sudduth has been appointed southern district representative for the Ranier Motor Corp. with headquarters in Birmingham, Ala. Mr. Sudduth was formerly in the same territory for the Bethlehem Motor Truck Co.

Franklin Joins Remy Electric—Milton W. Franklin, consulting electrical engineer, has been engaged by the Remy Electric Co., Anderson, Ind. Mr. Franklin formerly was with the General Electric Co. and was president and general manager of the C & C Electric Mfg. Co., Garwood, N. J.

Haskelite Is Increasing Force—The Haskelite Mfg. Co., Grand Rapids, Mich., is getting into swing on peace production. It is now employing fifty men. The factory was working to capacity on war contracts. Cancellation brought a suspension of operations, but production has been resumed and is increasing daily. The company is making pressed veneer car tops. As soon as the Grand Rapids plant nears capacity production the Ludington branch will reopen.

Kelly-Springfield Tire Dividends—The Kelly-Springfield Tire Co., New York, has declared a cash dividend of $1 a share and a stock dividend of 3 per cent on common, payable in common, on May 1 to stockholders of record April 15.

Savage Tire Promotes Chamberlain—L. S. Chamberlain, formerly manager of the San Diego branch of the Savage Tire Corp., has been promoted to the position of assistant sales manager with headquarters at the factory. H. E. Cresler, until recently with the Goodrich Tire & Rubber Co., succeeds him as branch manager.

Mahon Heads GMC Truck Department—W. L. Mahon, who has been with the General Motors Truck Co., Pontiac, Mich., for some time, has been made manager of a new department of the sales division of that company. He will have charge of research and statistics and preparing data on motor truck operation for GMC owners.

Simple to Add Truck Engines—The Simple Gas Engine Co., which has been manufacturing stationary and portable internal combustion engines in leased quarters at Neenah, Wis., for several years, is building a plant of its own, in which it will extend its production and also add multiple-cylinder engines for tractors and trucks as soon as arrangements can be made. F. J. Oberweiser is now president and general manager.

Some Changes in Boston—C. P. Cary, who has been manager of the New England branch of the Garford Motor Truck Co. for several years, coming from San Francisco, has resigned and is now in charge of the truck department of Alvin T. Fuller's agency for Packards. George B. Chapman, who came to Boston from the Federal Truck Co. of Detroit, to manage the agency placed by that company for New England, has resigned to take Mr. Cary's place with the Garford. The position of manager of the Federal agency has been filled by the appointment of C. E. Whitten, Jr., whose father controls the Federal business in Boston and vicinity.

Carlson Back with Commonwealth—Amel R. Carlson, who has completed his Government service on the purchasing staff of the Wright-Martin Aircraft Corp., New Brunswick, N. J., has returned as assistant general manager to the Commonwealth Motors Co.

Pierce-Arrow Sells Testing Plant—Pierce-Arrow has sold the $100,000 factory building erected for testing airplane engines to the Levering Brothers, Baltimore, Md., iron founders. The factory was used during the war for testing engines. It is near Buffalo.

Long Again with Columbia Motors—Raymond A. Long, chief engineer of the Columbia Motors Co., who for two years was engaged in Government work, where he assisted in designing the Militor truck, has returned to Detroit and resumed his duties with the Columbia Co.

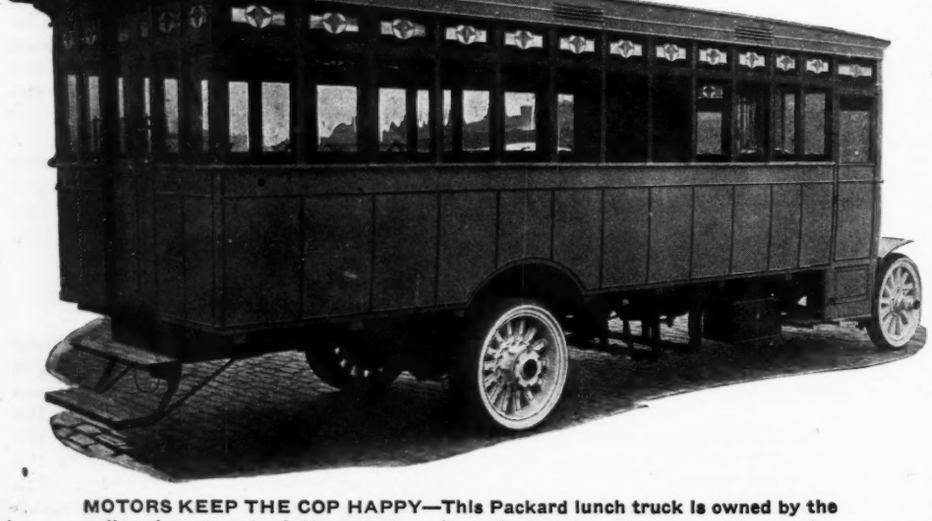
Goodrich-Lenhart Moves to New Factory—The general offices of the Goodrich-Lenhart Mfg. Co. have been moved to Hamburg, Pa., where the company has recently completed a new factory building. A sales office will be maintained in Philadelphia, where it has been for the last three years.

Williams to Join Kissel Distributer—Clifford A. Williams, director of sales of the Kissel Motor Car Co., Hartford, Wis., has resigned to take effect April 15. He is to become vice-president of the Western Motor Co., new distributer of Kissel products in California and Arizona. This organization is headed by Cuyler Lee, former Packard distributer.

Langstadt-Meyer Will Build—The Langstadt-Meyer Co., Appleton, Wis., which recently began the manufacture of farm lighting systems, is planning to build a complete new plant costing about $50,000. Originally the company was an electrical contracting concern, later engaging extensively in the sale and installation of farm lighting systems and industrial equipment.

Battery Trade Forms Association—The St. Louis Battery Trade Association has been organized with eleven members. H. E. Spoeneman of the Panama Rubber & Equipment Co. is president; William Fuetterer of the Fuetterer Battery Service Co., vice-president; R. G. McCurdy of the Western Electric Co. and William E. Moerschell of the Moerschell Electric & Auto Supply Co., directors.

Gary Truck Adds to Personnel—Several important additions have been made to the personnel of the Gary Motor Truck Co., although the officers remain unchanged. Frank Dawson has been appointed general manager. He was formerly factory manager of the Randolph Motor Truck Co., Chicago, was later with the Mogul Truck Co., St. Louis, Mo., and in 1916 was appointed factory manager for the Master Truck Co. E. Von Rakowski has been appointed chief engineer. Theodore B. W. Zumstein has entered the sales department. The Gary company has just closed a contract with the Cooper Motor Co., Kansas City, Mo., with branches in Omaha, Neb.; Tulsa, Okla., and other western and southwestern cities for more than a million dollars' worth of Gary trucks to be delivered the next twelve months. The company will operate



MOTORS KEEP THE COP HAPPY—This Packard lunch truck is owned by the police department of New York. It seats twenty policemen and contains kitchen, coffee machine and cupboards

as a factory branch and will have exclusive sales of Gary trucks in Missouri, Arkansas, Oklahoma, Western Iowa, Nebraska and South Dakota.

To Sell Farm Light Plant—A stock company has been organized at Gloster, Miss., to handle the Alamo farm light plant in Mississippi and Louisiana. Distributing points will be at Jackson, Miss., and New Orleans, La.

Page to Represent Commerce—R. E. Page, former assistant foreign sales manager of Dodge Brothers and previously with the Universal Motor Truck Co., has been placed in charge of Canadian representation for the Commerce Motor Car Co. He will make his headquarters in Toronto.

Bartlett with Wire Wheel—M. W. Bartlett, for the last five years secretary of the Splitdorf Electrical Co., has joined the Wire Wheel Corp. of America as eastern district representative with headquarters in New York. Service direction and export matters are also under his supervision.

Top Maker Opens Factory—C. T. Williams, motor car top manufacturer formerly of Dallas, Tex., has opened a shop and factory in Wichita Falls, Tex., under the name of the Williams Top Works. He will manufacture and repair tops, seat covers and curtains and will restore the plate glass in curtains for motor cars.

New Spring Factory for Standard Parts—A new spring factory is under construction for the Standard Parts Co. at Flint, Mich. It will replace the company's present Flint plant, long since outgrown. The new factory will have an immediate capacity four times greater than that of the old plant. Provision is made for further increases as needed.

Carlisle Cord Tire Putting Up Plant—The Carlisle Cord Tire Co. will establish its principal factory at Stamford, Conn., and has purchased about 10 acres. It is expected to be in operation by Aug. 1. At the outset it will employ 250 men. The main building is to be 250 by 150 ft., of cement, steel and glass, of sawtooth construction. The company has had a plant at Andover, Mass., for two years and intends to continue it in operation, although the main factory and executive offices will be moved.

Bay Back with Hyatt—Lieut. D. W. Bay has returned to his former position as sales engineer, Hyatt Roller Bearing Co., Detroit, in charge of Illinois, Wisconsin and the Northwest with offices at Chicago. For the last fifteen months he has been in the Motors Division, Department of Production, Quartermaster Corps.

New Torbensen Axle Officials—J. O. Eaton was elected president, with two vice-presidents, W. J. Baxter and C. F. Hepburn, at the directors' meeting of the Torbensen Axle Co. Other officers are: Chairman of the board, V. V. Torbensen; treasurer, F. A. Buchda; secretary, A. H. Ide; assistant secretary, R. C. Hyatt and comptroller, M. M. Risberg.

New Supervisors for Bates Tractor—George E. King has been appointed district supervisor for the Bates Machine & Tractor Co., Joliet, Ill., in Kansas, Nebraska, the Dakotas, Minnesota, Iowa, Colorado, Wyoming and Montana. Charles W. Holloway has been made supervisor of sales and service in the eastern and southwestern states. Both were formerly with Cleveland.

Durant Leases Pontiac Hotel—General Motors will begin work at once on its development in Pontiac, Mich., to which is to be devoted $2,150,000. To meet immediate needs the company has leased a local hotel which will be converted into dormitories for workmen. A big apartment is to be built at once on property purchased in the north end. A restaurant is to be erected at the Oakland plant.

American Bosch Adds to Staff—Additions and changes have taken place in the staff of the American Bosch Magneto Corp. W. G. Brown has been transferred from the New York office to become manager of the Chicago branch. T. C. Miller, formerly assistant branch manager at Detroit, assumes the position of branch manager at New York. Harold A. Wilson, formerly of the Diamond State Fiber Co., has joined the organization as assistant manager at Chicago. A. C. Hyser, who was in charge of the service department of the Willard Storage Battery Co., goes to Detroit to succeed T. C. Miller, and Oliver S. Stanley, who has been the assistant manager of the St. George Paper Co., Norwalk, Conn., has become assistant manager at New York.

Truck Distributer Expands—Exceptional success has caused the Heller Sales Co., Wapwollepen, Pa., to open up another place of business in Wilkes-Barre. It will retain the Wapwollopen place and operate sales and service stations in both towns. Wapwollepen has a population of less than 300 but the Heller company has sold more than 100 Commercial trucks in this territory.

To Make Uncle Sam Tractor—The U. S. Tractor & Machinery Co., which has been organized at Menasha, Wis., with a capital stock of $250,000, is equipping a machine shop and assembling plant, pending the construction of the first unit of its permanent plant. The company will specialize in the manufacture of the Uncle Sam tractor, a 20-30 type designed by G. D. Harris.

Ranier Gets New Connections—The Ranier Motor Corp., New York, has closed a contract with the Youroveta Home & Foreign Trade Co., Inc., New York, which has branches all over the world, whereby it gets exclusive sales rights for Ranier trucks in Argentina, China, Siberia and the Balkans. Shipments of from six to ten trucks are being made this month to each of these countries as samples.

To Manufacture Steering Knuckle—Ben J. Shaffer and Clayton Watson, Owosso, Mich., have formed a company to make a new steering knuckle for Ford cars. The patents cover the cones and lock-burs. The small brass bushings put out by Ford are replaced in this device by cones of highly tempered steel. The lock-bur is adjustable, which makes it possible to tighten the cones quickly.

Tractor Distribution Plant for St. Paul—W. H. Schmelzel, St. Paul, Minn., has about completed the plans for his $100,000 tractor distribution plant which he will build. Construction will begin as soon as the frost is out of the ground. Mr. Schmelzel is distributer for the Fordson tractor and equipment in Minnesota, and the new building will be used exclusively for that branch of his business.

PACKARD TAKES OVER PLANT

St. Louis, Mo., April 11—Packard has taken over the plant of the Packard-Missouri Motor Car Co. and the plant will be conducted as a factory branch known as the Packard Motor Co. of Missouri. P. S. Russell is manager.

This new arrangement succeeds the organization headed by W. J. Parrish, who has controlled the Packard distribution here for several years. Mr. Parrish retains the Packard distribution at Kansas City and Cleveland. He has leased the former Studebaker branch building in this city and will open a motor car paint shop. Paint work had been a strong feature of the Packard-Missouri Motor Car Co. work here.

ENTRIES FOR TRUCK EFFICIENCY

Detroit, April 11—To date 1700 trucks have entered for the second truck efficiency test being conducted by the Packard. The test will last a year, ending Jan. 31, 1920.

Definite figures as to the money saved through more efficient operation are now available, and it is told how $696 a year was the average saved by each leading truck in the test last year.

The monthly report of each truck is gone over at the factory by a truck transportation expert. He finds all the strong points and the weak ones, too. A complete analysis then is put down in writing, and a copy is sent to the owner with suggestions as to how he can get more work out of his truck or trucks with greater profit. That tremendous improvement is possible is shown by the fact that a truck in the first test was able to do more work at a decrease in expense of $1,000 for the year.

PERSHING HIGHWAY ORGANIZES

Lincoln, Neb., April 11—Governor McKelvie of Nebraska has called a meeting to be held here April 16 to perfect the organization of the Pershing Highway Association, tentative organization of which was effected March 7. The object of the organization is to map a route connecting the cities in which the principal events of General Pershing's life have occurred and at the same time provide a direct transcontinental route from New York to San Francisco. Including the District of Columbia, the road as tentatively outlined touches sixteen states and is formed of parts of old established highways.

OLYMPIA SHOW NOV. 7-15

Boston, Mass., April 11—Gray & Davis The Society of Motor Manufacturers and Traders has definitely fixed the dates for the Olympia motor car exhibition. These are Nov. 7-15 inclusive.

WEIGHTS DETERMINE FEES

Olympia, Wash., April 11—The new license law in this state taxes motor vehicles according to weight. The weights of all for-hire cars, stages and trucks have to be obtained by weighing on a public scale and the certificate of weight has to be attached to the application. The maker's shipping weight is taken for private cars.

The fee on cars is $10 for those of 1500 lb. or less with 60 cents a 100 lb. for excess over 1500. For-hire cars are $20 with 60 cents a 100 for excess and, in addition, $3 a passenger. Stages are $25; trailers, $10; trucks, $10, with the same addition for excess over 1500 lb.

STANLEY DEVELOPS RAILWAY CAR

Boston, Mass., April 11—Gray & Davis are building units for the newly formed Unit Railway Car Co., Newton, Mass., which is building the Stanley railway car for use on lines of any road. This car was designed by the Stanleys, and when the motor car plant was taken over by the new company they retained the patents for the vehicle. The car is operated by a steam engine and uses kerosene or fuel oil in the burner. The engine is geared direct to the driving axle by a spur gear and both units run in an oil bath in an oil-tight case.

From the Four Winds

Glimpses at the World of Motordom

WHAT TRACTORS ARE GOING TO SUPERSEDE—This plowboy and mule are typical in the South, but the tractor is going to supersede him completely later, as it is doing partially now

WILLIAMS Is Re-elected President—C. E. Williams was re-elected president of the Piqua Automobile Club at the annual meeting held in March; Carl Berryhill was selected vice-president, and A. L. Richie, secretary.

Prospects for New York Roads—New York state has, or had last fall, 184 unfinished state highway contracts, according to Charles J. McDonough, division engineer of the highway department. However, there is now in the highway fund about $15,000,000 unappropriated.

To Enforce Ohio Road-Drag Law—The enforcement of the road-dragging law is being sought by the motor organizations affiliated in the Ohio State Automobile Association. It is pointed out that the grading and scraping the roads in the spring is worth several times such work done after the rainy season. Two years ago, on behalf of the clubs, there was written into the state highway code a provision requiring the dragging of earth or unimproved roads at certain intervals. This was made compulsory on local road officials because in some localities great diligence was shown in caring for the dirt roads, while elsewhere they were neglected and soon became impassable. Clubs in all parts of the state are bringing pressure to bear on township and other officials to get busy as soon as possible with the grader and the drag.

Competition Too Much for 'Em—The Berrien County Anti-Horse Thief Society formed more than fifty years ago to make Berrien an unhealthy place for horse thieves has disbanded and the society's treasury balance of $50 has been turned over to the Michigan Children's Home Society. The reason for the disbanding of the society is that the motor car, truck and tractor have supplanted the horse and there are very few horses in the vicinity of Benton Harbor to be stolen.

Kentucky Wants 225-Mile Road—The improved highway from Paducah to Henderson, traversing McCracken, Livingston, Crittenden, Union and Henderson counties, will be extended to Owensboro and Louisville. If the plans of the Kentucky good roads boosters are carried out, the state will boast of a splendid highway 225 miles in length, beginning at Paducah and ending at Louisville. This highway will connect the east and central parts of the state with the Purchase and will be one of the most important trade outlets in the South. The projects of the various counties bolstered by Federal and state aid should insure an early realization of the plans.

Dodshon Heads Zanesville Club—J. H. Dodshon was elected president of the Muskingum Motor Club, Zanesville, Ohio, at the annual meeting held recently. The other officers are Howard Denny, first vice-president; P. R. Brehmer, second vice-president; D. W. Armstrong, secretary, and H. A. Sharpe, treasurer.

Clubs Fight Double Tax—The Akron Automobile Club has protested against the proposed increase in the license fees on cars. If the present Ohio classification is changed so cars will be removed from the list of personal property there would be no objection in paying an increased license fee, provided this increase meant better roads.

Wisconsin May Increase Speed Limits—The Wisconsin senate has passed a bill increasing the speed limit of motor vehicles to 30 m.p.h. outside of cities and villages. The present maximum is 25 m.p.h. In cities and villages the limit is 15 m.p.h., and this is to remain in force. The passage of the bill is believed assured.

Rice Heads Hoosier Club—H. H. Rice, sales manager of Nordyke & Marmon, has been elected president of the Hoosier Motor Club, succeeding Roy E. Adams. Mr. Rice was one of the organizers of the club and a member of its first board of directors. The other officers elected are Guy Jeffries, first vice-president; Leroy A. Mansfield, second vice-president; George Kanouse, treasurer, and M. E. Noblett, secretary.

Signs to Attract Passing Motorist—Attractive road markers pointing out the distance to Harrisburg and bearing an appropriate slogan advising motorists to stop there soon will be placed on highways leading to the city at points throughout all of central Pennsylvania, according to plans of the Harrisburg chamber of commerce, and Philadelphia is considering following the lead. The plan is to issue 10,000 booklets setting forth the advantages of the city as a business and residential center.

Wisconsin Club Plans Tours—The Wisconsin State Automobile Association elected the following officers for the new year: President, James T. Drought, Milwaukee; first vice-president, Dr. J. M. Dodd, Ashland; second vice-president, Dan O. Hoad, Kenosha; treasurer, George A. West, Milwaukee; secretary, H. A. Apple, Milwaukee. The W. S. A. A., which initiated competitive touring in Wisconsin as long ago as 1906, will resume social touring events this season after a lapse of several years. A run from Milwaukee to Ashland, across the entire state from south to north limits, is planned for July or August. The Ashland Automobile Club, just reorganized, has extended an invitation to make that city the objective. There is a bare possibility that competitive touring may be again undertaken, but it is believed more good can be accomplished by non-competitive events. The Ashland Club has elected these officers: President, O. E. Winters; vice-president, G. W. Denniston; secretary and treasurer, Gustave Johnson.

Coming Motor Events

SHOWS

Waynesburg, Pa.	Automobile Dealers' Association	April 16-19
Albany, Ala.		April 16-19
Bristol, Va.		May 10-17

MEETINGS

Hot Springs, Va.	Automotive Equipment Association	June 2-6

RACES

Indianapolis, Ind.	May 31
New York	June 14
Cincinnati, Ohio	July 5
Uniontown, Pa.	July 19
New York	July 26
Elgin, Ill.	Aug. 22-23
New York	Aug. 23
Uniontown, Pa.	Sept. 1
New York	Sept. 20
Cincinnati, Ohio	Oct. 1